Principles of formation of nanostructured oxide materials and nanosized catalysts on their basis for hydrogen power production applications

Project Completion Report

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Annexure-IX

PROJECT COMPLETION REPORT

Notes: 1. The PCR should be in bound form.

2. Cover page should include the title of the project, file number, names and addresses of the investigation

1. Title of the project: Principles of formation of nanostructured oxide materials and nanosized catalysts on their basis for hydrogen power production applications

2. Principal Investigator(s) and Co-Investigator(s):

Dr. Pankaj Bharali, Assistant Professor,

3. Implementing Institution(s) and other collaborating Institution(s):

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4. Date of commencement: 2nd September, 2015

5. Planned date of completion: 1st September, 2017

6. Actual date of completion: 31st March, 2023

7. Objectives as stated in the project proposal:

The main objective of this project is to develop novel shape and size controlled metal oxides ($Ce_xM_{1-x}O_y$, M = Gd, La, Mg) as supports for monometallic (Ni, Co, Pt) and bimetallic (combination of Ni, Co, or Pt with Pd, Rh, or Re) nanocatalysts for autothermal reforming of ethanol and pollutant control – in particular abatement of toxic CO emissions. To achieve this goal the following tasks will be undertaken:

(i) Synthesis of shape and size controlled $Ce_xM_{1-x}O_y$ nanocomposite oxides possessing the desired properties by varying:

- doped ion (M = Gd, La, Mg),
- molar ratio M/Ce (x= 0-0.5)
- preparation method (Hydrothermal, Pechini method or evaporation induced self-assembly (EISA))

(ii) Synthesis of supported monometallic and bimetallic nanocatalysts over the synthesized support oxides by incipient wetness impregnation, deposition precipitation, and other methods to achieve high dispersion of metal atoms at variation of metals (Ni, Co, Pt, Pd, Rh, Re) and metal content 5-15% for Ni, Co and 0.1-0.4% for other metals.

(iii) Characterization of synthesized oxide supports and corresponding supported metal nanocatalysts by XRD, TEM/HREM, SEM/EDX, XPS/AES, ISS, FTIR, RAMAN, TPR/TPO/TPD, TGA/DTA techniques.

(iv) Determination of the optimal characteristics of catalyst for the reaction of ethanol ATR and preferential oxidation of CO in presence/absence of moisture by varying the catalyst composition and preparation method.

(v) Density functional theory (DFT) will be used to study the effect of doped atoms on structure and catalytic activities of $Ce_xM_{1-x}O_y$, M = Gd, La, Mg.

(vi) DFT and QM/MM studies on the interaction of metal nanocluster with the support.

(vii) Reaction mechanism involved in autothermal reforming of ethanol and CO oxidation will be studied in details using QM/MM and DFT methods. These studies will help in understanding the interplay between various factors that influences the properties of supported-cluster interaction such as oxidation state (charge of the cluster), cluster size, interaction with the support.

8. Deviation made from original objectives if any, while implementing the project and reasons thereof:

The project objectives could not be completed from Indian side due to not receiving 2nd instalment of grant.

9. Experimental work giving full details of experimental set up, methods adopted, data collected supported by necessary table, charts, diagrams & photographs:

We have synthesized Mg, Co and Cu doped CeO_2-based mixed oxides of different compositions by precipitation method and applied as support for preparation of Ni and Pd nanocatalysts. For deposition of metals we employed surfactant aided co-reduction method. The samples are characterized by XRD, Raman analysis, TPR and XPS techniques.

Synthesis of CeO_x-MO_x (MO_x = CoO_x, CuO_x, MgO) mixed oxides

Typically, 48 mmol $(NH_4)_2C_2O_4$ was dissolved in 50 mL water to form a clear solution which was quickly added to 50 mL of $(NH_4)_2Ce(NO_3)_6$ and different metal salt solutions mixture

under stirring at 25 °C. After stirring for 40 min, the precipitate obtained was aged for 24 h. The precipitates were filtered, washed with deionised water and absolute ethanol, dried at 80 °C for 24 h. The oxide catalysts were obtained by sintering the precursors at 450 °C for 4 h. All details are presented in Table 1.

Table 1: Amount of $(NH_4)_2Ce(NO_3)_6$,$CoCl_2.6H_2O$, $CuCl_2.6H_2O$, $MgCl_2{\cdot}6H_2O$ and $(NH_4)_2C_2O_4$ employed for synthesis of CeO_2-based mixed oxides

Sr No	$(NH_4)_2Ce(NO_3)_6$ (g)	$CoCl_2{\cdot}6H_2O$ (g)	$CuCl_2{\cdot}6H_2O$ (g)	$MgCl_2{\cdot}6H_2O$ (g)	Salt ratio	$(NH_4)_2C_2O_4$ (g)
1	5.482	-	-	-	1:0	3.41
2	1.645	1.665	1.193	1.423	3:7	3.41
3	2.741	1.189	0.8524	1.017	1:1	3.41
4	3.837	0.7138	0.5114	0.6099	7:3	3.41
5	-	2.380	1.704	2.033	0:1	3.41

Synthesis of CeO_x-MO_x (MO_x = CoO_x, CuO_x, MgO) supported Ni and Pd catalyst:

In a typical synthetic procedure, to a suspension of CeO_2-CuO (0.25 g) dispersed in 50 mL distilled water, solutions of $NiCl_2.6H_2O$ (0.03 g, Ni loading 3 wt% or 0.2 g, Ni loading 2 wt%) and CTAB (0.041g) obtained by subsequent sonication and stirring for 30 min, 1.5 mL of $NaBH_4$ (0.02 g) was added dropwise. The contents of the flask was vigorously shaken for 10 min, resulting the generation of CeO_2-CuO supported Ni catalyst, which was collected by centrifugation and dried in vacuum oven. Similar procedure was employed with $PdCl_2$ (0.0041 g, Pd loading 1 wt%) for synthesis of Pd/CeO_2-CuO. To synthesize Ni and Pd catalysts over other supports we employed identical procedure.

Characterization:

XRD Analysis: The XRD analyses of the (1:1) composition of the three mixed oxides Ce-Co, Ce-Cu and Ce-Mg series are shown in Fig 1. In all the figures the diffraction peak for CeO_2 are observed at 2θ =28.54, 33.07, 47.47, 56.33, 69.40, 76.68 and 79.06° which could be assigned to (111), (200), (220), (311), (400), (331) and (420) reflections, respectively for the face-centered cubic CeO_2 phase (JCPDS card no. 81-0792). In the Fig (a) the diffraction peaks observed at 19.04, 31.24, 36.86, 44.85, 59.38 and 65.26° corresponds to (111), (220), (311), (400), (511) and (440) reflections, respectively of fcc-Co_3O_4 phase (JCPDS card no.

42-1467). Similarly, in the Fig (b) the diffraction peaks observed at 35.26°, 38.72° and 58.24° are assigned to (002), (200), and (202) reflections, respectively for the monoclinic end-centered CuO phase (JCPDS card no. 80-0076). In the Fig (c) the diffraction peaks observed at 42.78 and 62.14° could be assigned to (200) and (220) reflections, respectively of fcc-MgO phase (JCPDS card no. 89-7746).

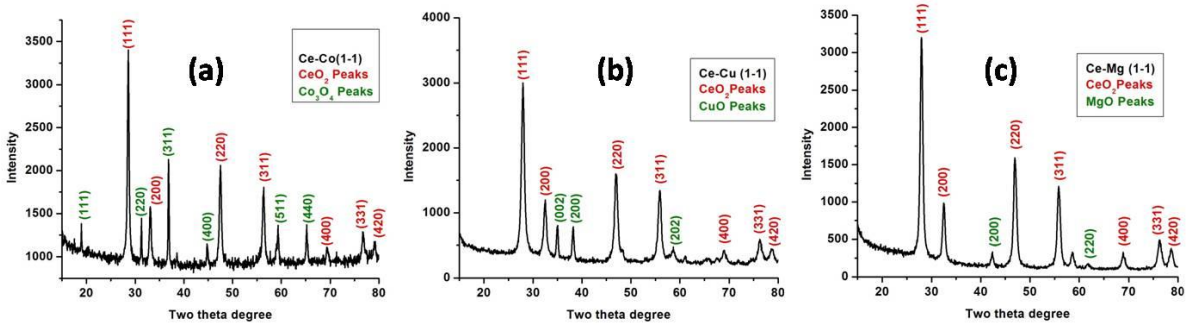

Fig 1: XRD profile of Ce-Co (a), Ce-Cu (b) and Ce-Mg (c) mixed oxides.

Raman Analysis: Fig 2 shows the Raman spectra of the Ce-Co, Ce-Cu and Ce-Mg mixed oxides. The spectrum reveals 3 vibration modes for both the Ce-Co and Ce-Cu mixed oxides. The three Raman modes are centered at 464, 623 and 1190 cm^{-1}. The most intense vibration for both Ce-Co and Ce-Cu mixed oxides mode at 464 cm^{-1} is the F_{2g} Raman active mode of CeO_2. In addition, a broad band in the range 500 to 650 cm^{-1} associated to the presence of oxygen vacancies.

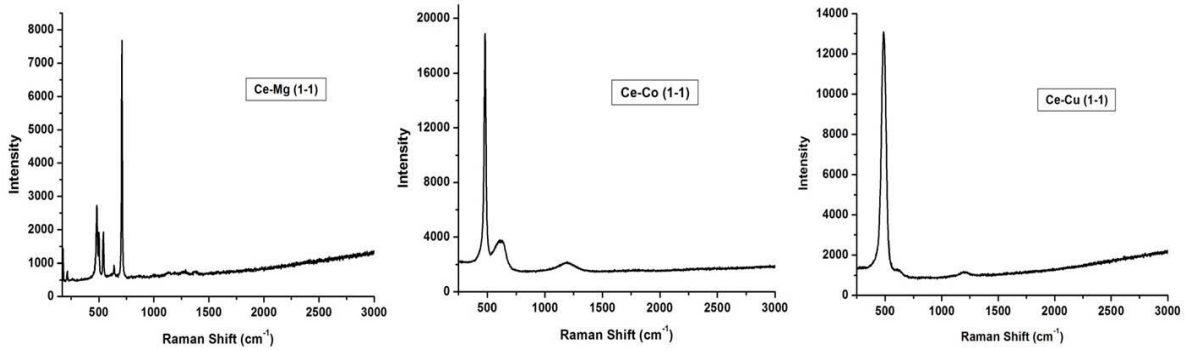

Fig 2: Raman spectra of Ce-Mg, Ce-Co and Ce-Cu mixed oxides.

Temperature programmed reduction:

Fig 3 shows the H_2-TPR of Ce-Co and Ce-Cu mixed oxide supports and Ni/CeO_2-CoOx. H_2-TPR profile shows two reduction peaks within 900°C for the Ce-Cu mixed oxide, single reduction peak for both Ce-Co mixed oxide and Ni/CeO_2-CoOx. The Ce-Cu oxide shows the highest reducibility, the reduction of Ce-Cu starts at 100°C and completes at 220°C, and

shows two peaks at about 185 and 780°C. The low temperature reduction peak is associated to highly disperse copper species in strong interaction with ceria. For the Ce-Co mixed oxide the reduction takes place between 230-380°C with single peak at 340°C and for Ni/Ce-Co oxide the reduction starts at 280°C and completes at 430°C and shows a single peak at 370°C.

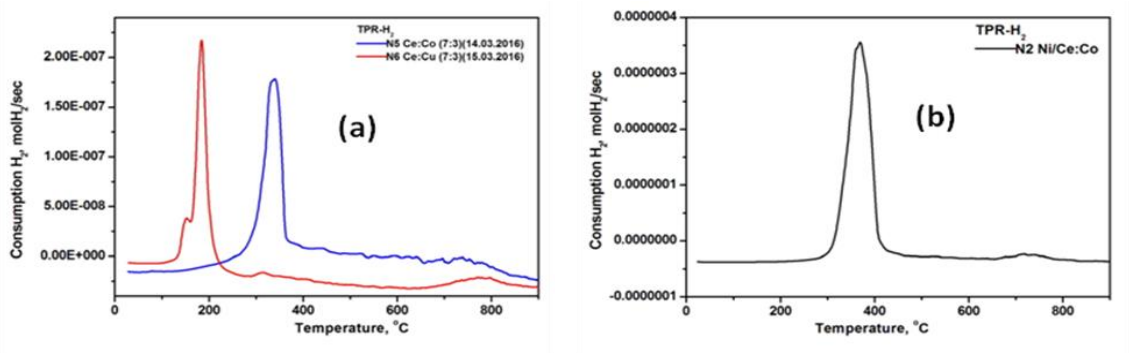

Fig 3: H_2-TPR profiles for Ce-Cu, Ce-Co mixed oxides (a) and Ni/CeO_2-CoOx (b).

XPS analysis:

The catalyst surface composition was studied by XPS. The binding energies of the typical spectra of O 1s, Ce 3d and Cu 2p of the CeO_2-CuO catalyst with Ni loading of 5 wt% are shown in Figure 4. As shown in Figure 4(a), the O 1s peaks are centered at 529.3 eV, which is assigned to the lattice oxygen of the CeO_2 and CuO. In addition, there is a shoulder peak at *ca.* 531.2 eV in the catalyst, which may be attributed to the absorbed oxygen or oxygen in hydroxyl groups. In Figure 4(b), the Ce 3d shows mainly six peaks at about 882.6, 889.2, 898.9, 901.1, 907.7 and 916.7 eV, which can be assigned to the Ce^{4+} species indicating that the main valence of CeO_2 in the catalyst is +4. It can also be observed that the peaks of Cu $2p_{3/2}$ and Cu $2p_{1/2}$ are centered at 933.1 and 953.1 eV, respectively. Furthermore, the shake-up peak (940.0 -945.0 eV) are characteristic for CuO.

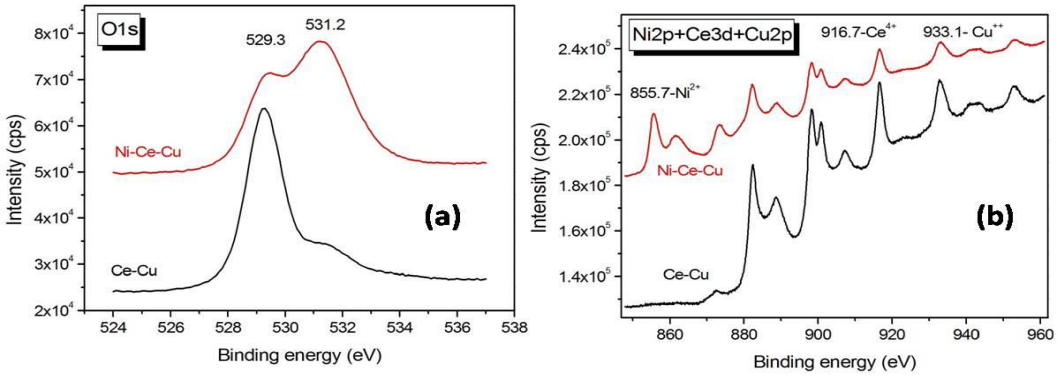

Fig 4: XPS spectra of O1s (a), Cu 2p and Ce 3d (b) of CeO_2- CuO and Ni/CeO_2-CuO catalyst.

Further works has been carried out collaboratively at BIC, Russia

Material preparation

$Ce_{1-x}M_xO_y$ supports (M = Gd, La, Mg) were prepared by polymerizable complex method. The molar fraction (x) of doping cation (M) was varied from 0.1 to 0.9. For comparative purpose, the one-component oxides (CeO_2, Gd_2O_3, La_2O_3, MgO) were also synthesized in a similar way. The calcination temperature of prepared supports was 500^{o}C.

The Ni/$Ce_{1-x}M_xO_y$ catalysts (Ni content - 2-15 wt.%) were prepared by incipient wetness impregnation of $Ce_{1-x}M_xO_y$ supports (M = Gd, La, Mg, x = 0-1) with aqueous solutions of nickel nitrate. After impregnation, the samples were dried at 90^{o}C and calcined in air for 4 h at 500°C. The number before nickel in the catalyst name corresponds to the Ni content (wt.%).

Material characterization

The prepared materials ($Ce_{1-x}M_xO_y$ supports, Ni/$Ce_{1-x}M_xO_y$ catalysts) were characterized by X-ray spectral fluorescence analysis (ARL ADVANT′X analyzer, ThermoTechno Scientific, Switzerland), N_2 adsorption/desorption (automated ASAP 2400 volumetric system, Micromeritics, USA), X-ray diffraction (HZG-4C diffractometer, Freiberger Prazisionmechanik, Germany), high resolution transmission electron microscopy (HRTEM) (JEM-2010, JEOL Ltd., Japan) and thermal analysis (TA) in 5%H_2/He (NETZSCH STA 449 C thermal analyzer, NETZSCH Geratebau GmbH, Germany) in accordance with the procedures described previously.

Catalytic activity measurements

The catalytic activity of $Ce_{1-x}M_xO_y$ supports and Ni/$Ce_{1-x}M_xO_y$ catalysts in ATR of C_2H_5OH was measured in a flow setup with a quartz reactor (14 mm inner diameter) at atmospheric pressure, temperature 200-700°C, a flow rate of 230 mL/min and the molar ratio between reagents C_2H_5OH : H_2O : O_2 : He = 1 : 3 : 0.5 : 1.

The analysis of reaction mixtures was performed using the online automatic gas chromatography (GC) system Kristall 2000 m (Russia) with flame ionization detector (FID) and thermal conductivity detector (TCD). C_2H_5OH, CH_3CHO, CH_3COCH_3, CH_4 were separated using a stainless-steel packed column (length, 1.5 m; inner diameter, 3 mm; column temperature, 165 °C) filled with a polymer sorbent HayeSep S and analyzed via FID. H_2, He, CO, CO_2, C_2H_4 and C_2H_6 were separated using a stainless-steel packed column (length, 1.5 m; inner diameter, 3 mm; column temperature, 165°C) filled with SKT charcoal and analyzed by the TCD system, which was operating with helium as a carrier gas.

In order to minimize the hot spot formation in the catalyst bed, the 0.5 g sample (fraction of 0.25–0.50 mm) was diluted by 1.5 g of higher heat conductivity and thermal stability β-SiC of the same particle fraction. Before reaction, the catalyst was reduced in H_2/He at a flow rate of 100 mL/min at 700°C for 60 min. Yields of H_2 and products (C_i = CO, CO_2, CH_4, C_2H_4, CH_3CHO, CH_3COCH_3) were determined as percent of products produced by the reaction from maximally possible amounts e.g.

$$Y_{H2} = 100 \cdot V_{H2}^{out} / (3 \cdot V_{C2H5OH}^{in} + V_{H2O}^{in}),$$

where Y_{H2} is a yield of H_2, %; V_{H2}^{out} is a molar rate of H_2 at the reactor outlet, mol/min; V_{C2H5OH}^{in} is a molar rate of C_2H_5OH introduced into the reactor, mol/min; V_{H2O}^{in} is a molar rate of H_2O introduced into the reactor, mol/min.

$$Y_{Ci} = 100 \cdot i \cdot V_{Ci}^{out} / 2 \cdot V_{C2H5OH}^{in},$$

where Y_{Ci} is a yield of C_i, %; V_{Ci}^{out} is a molar rate of C_i at the reactor outlet, mol/min; i – quantity of carbon atoms in C_i; V_{C2H5OH}^{in} is a molar rate of C_2H_5OH introduced into the reactor, mol/min.

Selectivity of C_i formation was determined as:

$$S_i = i \cdot V_{Ci}^{out} / \Sigma\, i \cdot V_{Ci}^{out},$$

where S_i is formation of C_i product, %; i – quantity of carbon atoms in C_i; V_{Ci}^{out} is a molar rate of C_i at the reactor outlet, mol/min. The experimental error in the value of methane conversion and product yields is 10%.

The calculation of the thermodynamic outlet composition was made using an in-house software package based on the minimization of the Gibbs free energy method.

10. Detailed analysis of results indicating contributions made towards increasing the state of knowledge in the subject:

Characterization of supports and catalysts

The $Ce_{1-x}M_xO_y$ supports were synthesized by polymerizable complex method at variation of type (Gd, La, Mg) and molar fraction (x) of doping cation (M). In this work, we increased content of doping cation up to x = 0.8-1.0 and analyzed information for all $Ce_{1-x}M_xO_y$ samples with x = 0-1. The chemical composition of calcined materials determined by X-ray fluorescence spectroscopy was in good agreement with specified value. The specific surface area (S_{BET}) of $Ce_{1-x}M_xO_y$ was changed as a function of chemical composition of materials in the wide range of values. With an increase of x from 0.1 to 0.9 it decreases from 95 to 20 m^2/g for M = Gd, from 95 to 25 m^2/g for M = La and from 70 to 45 m^2/g for M =

Mg. So the S_{BET} has maximum value at low molar fraction of M and at x = 0.1-0.2 grows in the following sequence of cations: Mg < Gd < La. Among one-component samples the CeO_2 has relatively high value of S_{BET} – 75 m^2/g, while the specific surface area of the rest was under 25 m^2/g. In particular, it is equal to 15, 25 and 20 m^2/g for Gd_2O_3, La_2O_3 and MgO samples, respectively. The obtained results indicate that the $Ce_{1-x}M_xO_y$ mixed oxides inherit the high S_{BET} of ceria in comparison with M-oxides (M = Gd, La, Mg) and gain the stability against sintering. It is noted that specific surface area of $Ce_{1-x}M_xO_y$ materials synthesized by polymerizable complex method is higher than those of samples prepared by sol-gel or citrate complexation methods.

The partial substitution of Ce^{4+} with M^{n+} is confirmed by shifting of diffraction peaks toward lower (in case of Gd^{3+}, La^{3+}) or higher (in case of Mg^{2+}) angles due to the difference in cation radius of Ce^{4+} (0.97 Å) and those of doping cations M (1.05 Å - Gd^{3+}, 1.16 Å - La^{3+}, 0.72 Å - Mg^{2+}). The cubic fluorite structure of CeO_2 is the sole constituent of the XRD patterns of $Ce_{1-x}M_xO_y$ oxides up to x = 0.4-0.6 for Gd, x = 0.6 for La and x = 0.5-0.9 for Mg-containing solutions. In our case the existence of $Ce_{1-x}Gd_xO_y$ and $Ce_{1-x}La_xO_y$ solid solutions in the wider range of x is connected with the mode (polymerizable complex method vs. co-precipitation) and conditions (low calcination temperature 500°C vs. 800-1300°C) of $Ce_{1-x}M_xO_y$ preparation. The phase composition of $Ce_{1-x}M_xO_y$ oxides (x = 0 or 1), which are the one-component systems, after calcination at 500°C are cerium oxide CeO_2 (x = 0), $La_2O_2CO_3$ lanthanum oxycarbonate (x = 1, M = La), Gd_2O_3 gadolinium oxide (x = 1, M = Gd) and MgO magnesium oxide (x = 1, M = Mg), respectively.

The volume of unit cell for $Ce_{1-x}M_xO_y$ is changed in accordance with radius and content of doping cation. The average crystallite size (coherent scattering region, CSR) was estimated by applying the Scherrer equation to the characteristic (111) peak of CeO_2 from the XRD. These results indicate that it is sensitive to the molar fraction of doping cations. With an increase of the molar fraction of the doping cation from 0 to 0.9, the crystallite size decreases from 12 to 3 nm (Fig. 5), thus supporting the literature data. According to the HRTEM data, the crystallites form polycrystalline agglomerates mainly in the form of plates. The values of CSR are equal to 12 nm, 15 nm and 20 nm for Gd_2O_3, La_2O_3 and MgO samples, respectively.

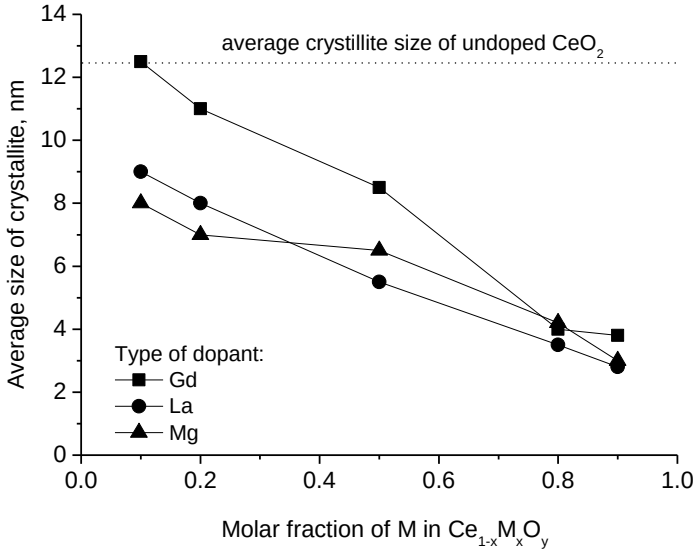

Fig. 5 The crystallite size of $Ce_xM_{1-x}O_y$ supports versus molar fraction (x) of dopant M = Gd, La, Mg.

The prepared $Ce_xM_{1-x}O_y$ oxides were used as supports for Ni-containing particles as active component of catalysts for ATR of C_2H_5OH. Compared with S_{BET} of $Ce_xM_{1-x}O_y$ supports, the corresponding S_{BET} value for $Ni/Ce_xM_{1-x}O_y$ catalysts decreases that can be attributed to the blockage of the pores in the support by NiO or some phase transformations. This effect is intensified by increasing of the Ni content in the catalyst composition. Thus, with an increase of Ni content from 2 to 15 wt.% the reduction of the specific surface area increases from 15 to 30%. Nevertheless the tendency in the surface area dependence on type and content of dopant was maintained. In particular, higher values of specific surface area are found for Ni catalysts based on $Ce_xM_{1-x}O_y$ supports with low molar fraction of dopants or containing La as dopant.

At low Ni content (2 and 5 wt.%) XRD patterns of $Ni/Ce_xM_{1-x}O_y$ catalysts (M = Gd, La, Mg; x = 0.1-0.9) showed only the diffraction peaks corresponding to the fluorite type cubic phase of support. There is no evidence of NiO phase in the XRD patterns indicating that in this case NiO species are highly dispersed. At higher Ni loading (10 and 15 wt.%) for $Ni/Ce_xM_{1-x}O_y$ samples the existing phases were cerium based oxide and Ni-containing phase (Fig. 6a). It is noted that the introduction of nickel does not practically affect the lattice parameter as well as crystallite size of the CeO_2-based phase of support. With respect to the

Ni catalyst supported on the one-component systems (x = 0 or 1) the formation of NiO phase is only found in case of CeO_2 support (Fig. 2b). In the Ni/La_2O_3 samples in addition to $La_2O_2CO_3$ the $LaNiO_3$ phase was formed while in the Ni/Gd_2O_3 and Ni/MgO samples the observed phases were phases of supports – Gd_2O_3 (a mixture of monoclinic and cubic types) and MgO, respectively.

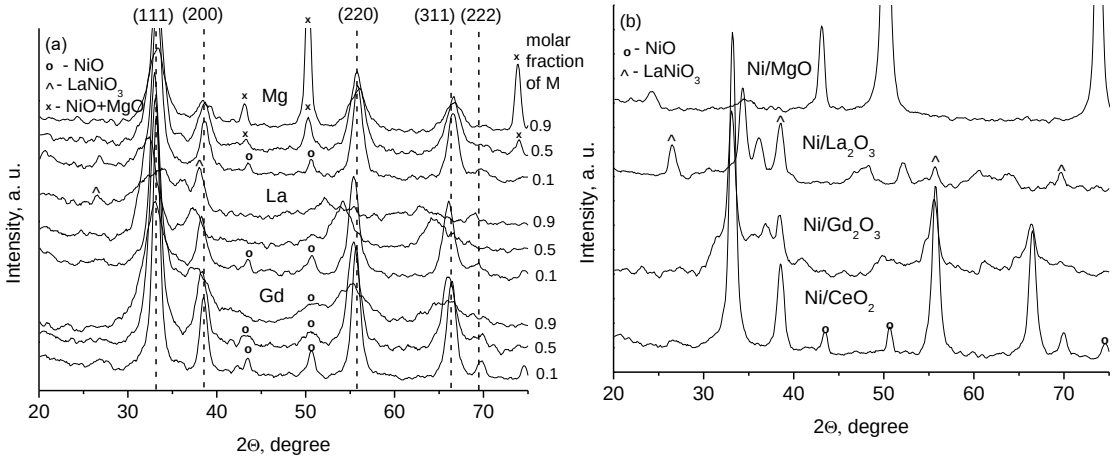

Fig. 6. X-ray diffraction patterns of $Ni/Ce_xM_{1-x}O_y$ catalysts (M = Gd, La, Mg; x = 0-1). Ni content is 10 wt.%. (a) x = 0.1; 0.5; 0.9; (b) x = 0; 1. The broken vertical lines indicate the characteristic peaks of cubic ceria (JCPDS 43-1002).

As follows from the XRD results the form of stabilization of the Ni active component depends on the composition of $Ce_xM_{1-x}O_y$ support (Fig. 6a). The first type of Ni species are nickel oxide particles. This form of stabilization is realized in the case of cerium dioxide doped with Gd (x = 0.1-0.9), La (x = 0.1-0.8) or Mg (x = 0.1-0.2). It should be noted that irrespective of dopant type the intensity of the XRD line of the NiO phase decreases with an increase of dopant content (Fig. 6a). Another form of stabilization is Ni-La-O and Ni-Mg-O solid solutions and their formation is observed for supports containing high molar fraction of La (x = 0.9) or Mg (x = 0.5-0.9), respectively. Particularly, the XRD spectra of $Ni/Ce_{0.1}La_{0.9}O_{1.55}$ showed the peaks relevant to support and $LaNiO_3$, while the formation of NiO-MgO solid solution is indicated by the value of the lattice parameter of NiO. It was in the range 4.201-4.218 Å which is notably higher than those for ´´pure´´ NiO (4.177 Å). The average particle size of NiO decreases with a decrease of Ni content, with an increase of molar fraction of dopant in $Ce_xM_{1-x}O_y$ support and in the following sequence of dopants: Mg

> Gd > La (Fig. 7). So for 10Ni/$Ce_xGd_{1-x}O_y$ catalysts the change of x from 0 to 0.9 leads to a decrease of NiO particle size from 25 to 4 nm. In case of 10Ni/$Ce_xLa_{1-x}O_y$ samples with the increase of molar fraction of La from 0 to 0.2, the size of the NiO particles decreases from 25 to 15 nm, and when the x = 0.5-0.8 nickel oxide is in the atomically dispersed state. A somewhat different dependence is observed for Mg-containing materials (Fig. 7) that is connected with the stabilization of Ni in different forms: NiO oxide at x = 0-0.2 and NiO-MgO solid solution at x = 0.5-0.9 (Fig. 6a). First, at low values of x in $Ce_xMg_{1-x}O_y$ support there is a decrease in particle size of NiO, however, with the formation of solid solution at higher value of x, the size of the Ni-containing phase increases. From Fig. 7 it follows that differences in NiO particle size have no correlation with value of specific surface area of supports. Specifically the improvement of NiO dispersion with a growth of x occurs at a decrease of S_{BET} of $Ce_xM_{1-x}O_y$ supports. Thus at other things being equal dispersion of nickel oxide is substantially controlled by chemical composition of the support.

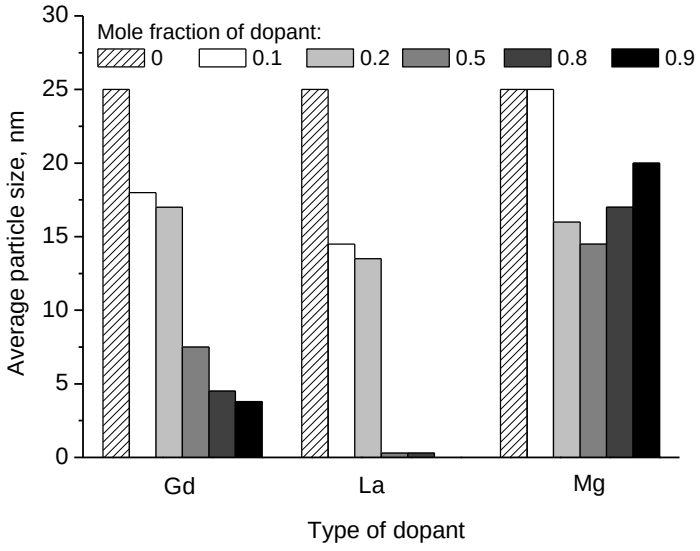

Fig. 7. Effect of support composition on the average particle size of Ni-containing phase in 10Ni/$Ce_xM_{1-x}O_y$ catalysts. Ni-containing phase is NiO for M = Gd (x = 0=0.9); M = La (x = 0-0.8); M = Mg (x = 0-0.2). Ni-containing phase is NiO-MgO solid solution for M = Mg (x = 0.5-0.9).

It is shown that Rh metal dispersion increases from 47 to 83% with a decrease of CeO_2 crystallite size from 29.3 to 6.5 nm. Analogously in our case the increase of molar

fraction of dopant is accompanied by a decrease of crystallite size of $Ce_xM_{1-x}O_y$ support (Fig. 5) that leads to enhancement of NiO dispersion (Fig. 7). More effective reduction of particle size of the Ni active component occurs at using of La as a dopant. When the crystallite size of the $Ce_xM_{1-x}O_y$ support is equal to ~4 nm the size of the Ni-containing species is 4.5 nm, atomically dispersed and 17 nm for Gd, La and Mg-containing catalysts, respectively (Fig. 5, Fig. 7). The electron microscopy data confirm the results of the X-ray phase analysis. From TEM images of $10Ni/Ce_{0.2}M_{0.8}O_y$ catalysts (Fig. 8) it follows that the $Ce_{0.2}M_{0.8}O_y$ support is present as well-crystallized solid solution on the base of CeO_2 with crystallite size of 3-5 nm. The average lattice inter-planar spacing of 0.3059 nm (M = Gd), 0.3229 nm (M = La) and 0.3058 nm (M = Mg) correspond to the crystal face of the doped ceria. The Ni-containing particles of 5-10 nm and 10-20 nm in size were found on the surface of $10Ni/Ce_{0.2}Gd_{0.8}O_{1.6}$ (Fig. 8a) and $10Ni/Ce_{0.2}Mg_{0.8}O_{1.2}$, respectively, whereas the $10Ni/Ce_{0.2}La_{0.8}O_{1.6}$ catalyst contains NiO particles of 2 nm in size (Fig. 8b) and Ni clusters of 0.5 nm in size (Fig. 8c). STEM/EDX elemental mapping identified nickel clusters well dispersed within the $Ce_{0.5}La_{0.5}O_{175}$ support. The insertion of M^{n+} cations (M = Gd, La, Eu, Y, Pr, Sn) in the CeO_2 structure as well as the decrease of CeO_2 crystallite size provokes an increase in the oxygen vacancies concentration of material. In turn, the contact of supported active species with the surface oxygen defects of support allows special metal-support interaction. The observed results seem to suggest that the surface defects of $Ce_xM_{1-x}O_y$ are anchors for fixing the Ni-containing species, which ensures their resistance to sintering and, consequently, high dispersion.

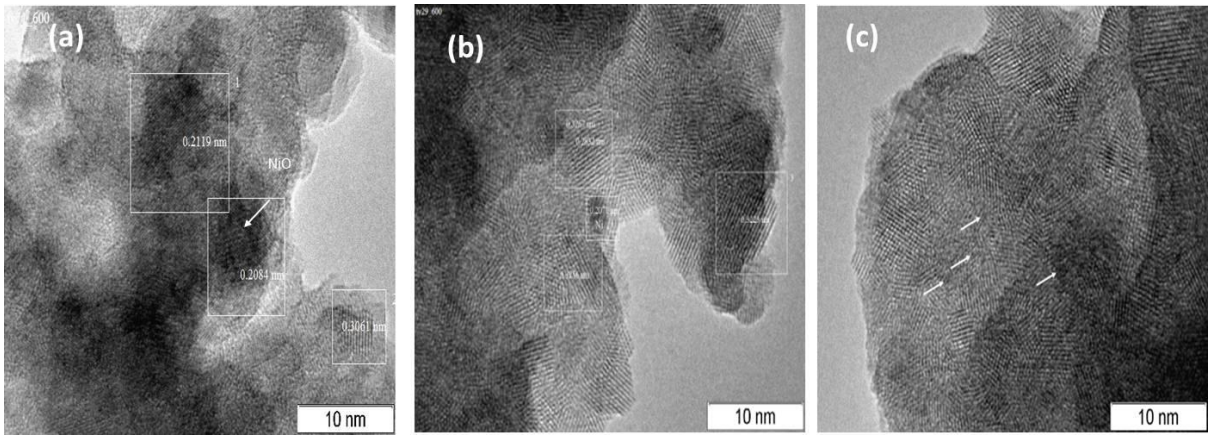

Fig. 8. TEM images of $10Ni/Ce_{0.2}Gd_{0.8}O_y$ (a) and $10Ni/Ce_{0.2}La_{0.8}O_y$ (b, c) and catalysts.

The thermal analysis in 5%H_2/He was carried out to reveal the relation between the reducibility of Ni active component and composition of catalyst. As a typical example, Fig. 9 (a, b) shows TG (thermogravimetric), DTG (differential thermogravimetric) and DTA (differential thermal analysis) curves of $Ce_{0.8}La_{0.2}O_{1.9}$ and 15Ni/$Ce_{0.8}La_{0.2}O_{1.9}$ samples.

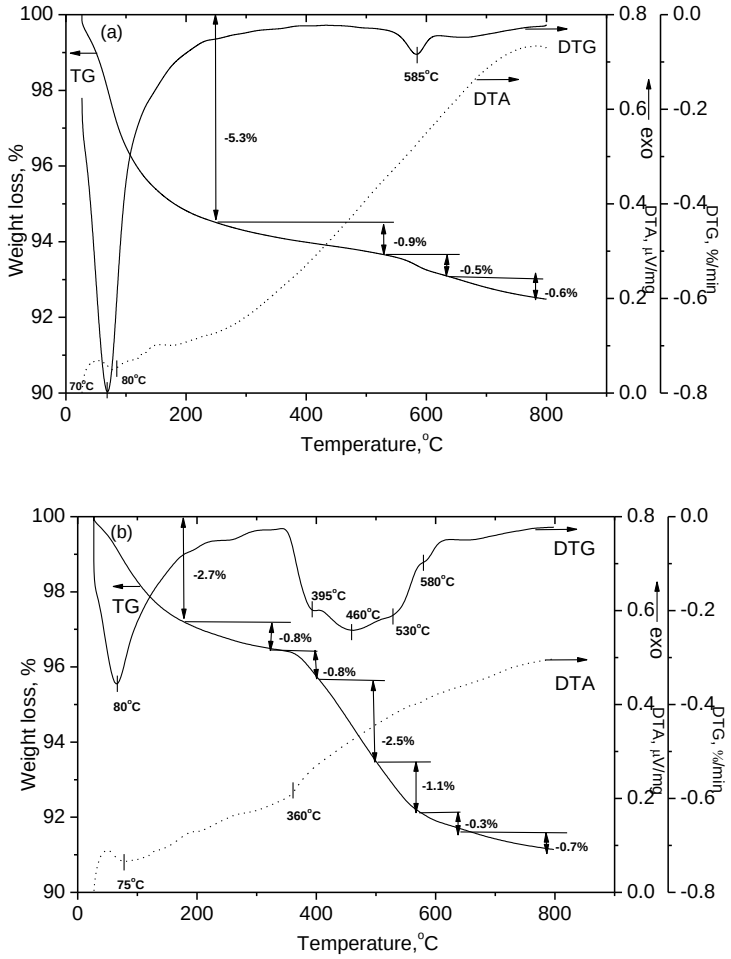

Fig. 9. TG, DTG and DTA curves of $Ce_{0.8}La_{0.2}O_{1.9}$ support (a) and 15Ni/$Ce_{0.8}La_{0.2}O_{1.9}$ catalyst (b).

For $Ce_{0.8}La_{0.2}O_{1.9}$ support in the low-temperature region (T < 200°C) an endothermic effect which is observed, accompanied by sample weight loss due to elimination of the adsorbed water. In the high-temperature region distinct thermic effects do not exist, but weight loss of the sample occurs at 585°C (-Δm/m = 0.5 wt. %). According to H_2-TPR, reduction of doped CeO_2 exhibits two regions of hydrogen consumption which may be assigned to reduction of surface species (300-600°C) and bulk particles (600-900°C). It can

be assumed that the observed weight loss in the region T > 200^{o}C is related to the reduction of the Ce^{4+} cations, localized on the surface of the particles. TA curves of 15Ni/$Ce_{0.8}La_{0.2}O_{1.9}$ catalyst differs from those of $Ce_{0.8}La_{0.2}O_{1.9}$ support, mainly at the temperature range of 350-550^{o}C where significant weight loss of the sample is observed (-Δm/m = 4.4 wt. %) (Fig. 8b). This effect may be connected with Ni^{n+} reduction. The lower Ni content (from 15 to 2 wt. %) leads to expected decrease in weight changes (-Δm/m from 4.4 to 0.8 wt. %) due to the reduction of Ni^{2+} cations (Fig. 10a). Irrespectively of Ni content, there is a peak at 580^{o}C that is attributed to reduction of support. Fig. 10a shows that with an increase of Ni content a shift towards lower temperatures of the peak connected with NiO reduction occurs. The temperature of the beginning of Ni^{2+} reduction is equal to 400 and 350^{o}C for 2 wt.% and 15 wt.% samples, respectively. This finding allows us to conclude that reducibility of nickel cations increases with an increase of Ni content in the catalyst. Tt may be connected with the increase of NiO particle size and the decrease of metal-support interaction.

The variation of $Ce_xM_{1-x}O_y$ support composition also affects the reducibility of Ni active component (Fig. 10b-d). It can be seen that reducibility of Ni^{2+} becomes worse at the use of Mg-containing support (Fig. 10d). Based on the XRD data (Fig. 6), it can be assumed that this is due to formation of NiO-MgO solid solution, the reduction of which occurs above 600^{o}C. The process of Ni cation reduction shifts to higher temperature region with increase of molar fraction of the dopant (Fig. 10b,c). This indicates that high dopant concentration in support impedes reducibility of Ni^{2+} cations. As it was mentioned above, the increase of M content in $Ce_xM_{1-x}O_y$ induces the decrease of crystallite size of support, increase of surface defect concentration and, thus, enhancement of metal-support interaction. So the observed improvement in dispersion of Ni active component is accompanied by a decrease in its reducibility due to the increase in the degree of interaction between nickel and the $Ce_xM_{1-x}O_y$ support. The observed changes in the physicochemical properties of the catalysts should lead to a change in their catalytic properties.

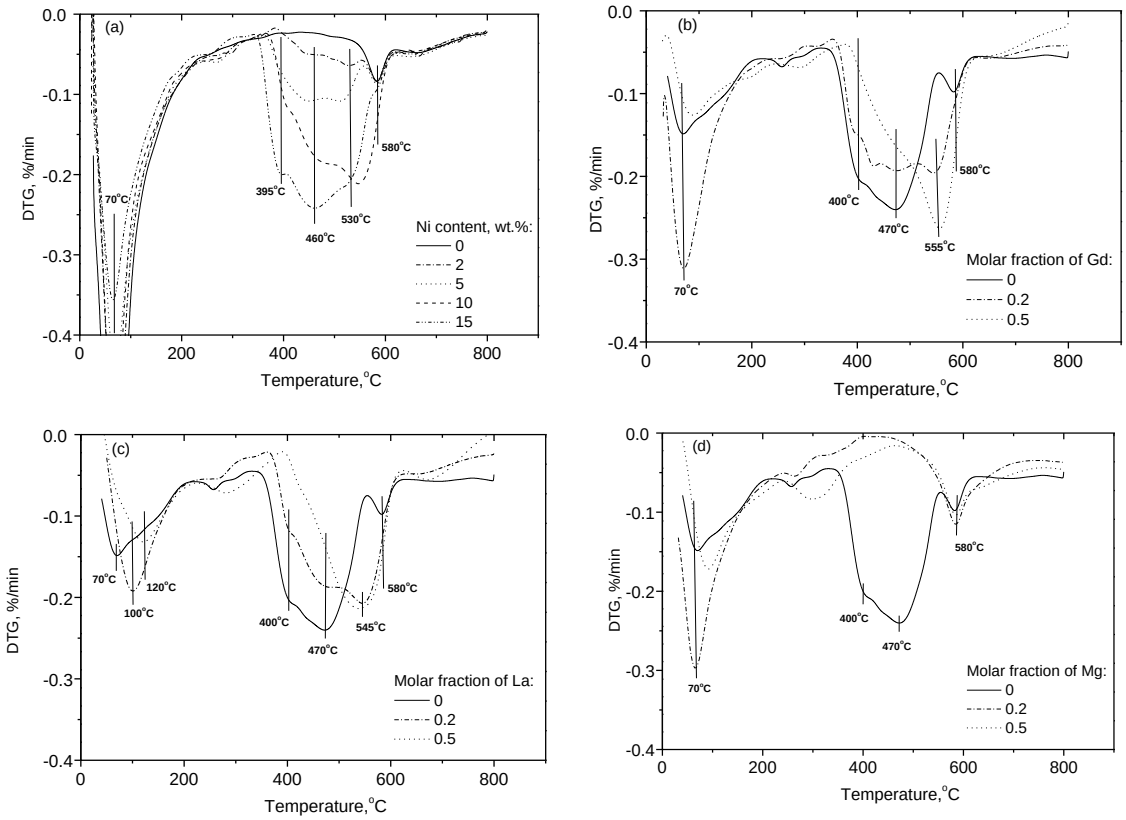

Fig. 10. DTG curves of $Ni/Ce_{0.8}La_{0.2}O_{1.9}$ (a), $10Ni/Ce_{1-x}Gd_xO_y$ (b), $10Ni/Ce_{1-x}La_xO_y$ (c) and $10Ni/Ce_{1-x}Mg_xO_y$ (d) catalysts.

Catalytic activity of supports and catalysts in ATR of C_2H_5OH reaction

The effect of chemical composition of $Ce_{1-x}M_xO_y$ and $Ni/Ce_{1-x}M_xO_y$ materials (M = Gd, La, Mg; x = 0-1) on their catalytic performance in ATR of C_2H_5OH reaction is shown in Fig. 11-17 and Tables 2. Over $Ce_{1-x}M_xO_y$ supports (M = Gd, La, Mg; x = 0-1) the ethanol conversion (X_{C2H5OH}) and hydrogen yield (Y_{H2}) rise with an increase of the reaction temperature (Fig. 11). The CeO_2 oxide and $Ce_{1-x}M_xO_y$ mixed oxides (x = 0.1-0.9) are characterized by higher ethanol conversion in the low-temperature region in comparison to X_{C2H5OH} over Gd_2O_3, La_2O_3 and MgO samples. However over all $Ce_{1-x}M_xO_y$ supports (x = 0-1) complete conversion of C_2H_5OH could be only obtained at 700°C. Supports themselves provide 10-15% yield of H_2 at reaction temperature of 600°C and their performance has trend to improve in the following sequence: $MgO < Gd_2O_3 \sim La_2O_3 < Ce_{1-x}M_xO_y < CeO_2$.

Irrespectively of support composition, in addition to hydrogen, the formation of a wide range of carbon-containing products (C-products) was observed: acetaldehyde, acetone,

ethylene, methane and carbon oxides. As a typical example, Fig. 12 shows the selectivity of C-products formation in the ATR of C_2H_5OH over $Ce_{0.8}La_{0.2}O_{1.9}$ support.

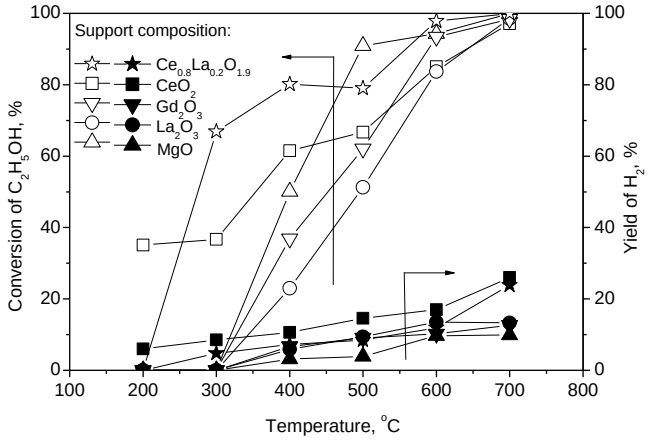

Fig. 11. Ethanol conversion (open symbols) and hydrogen yield (bold symbols) in ATR of C_2H_5OH vs. reaction temperature over supports of different chemical composition.

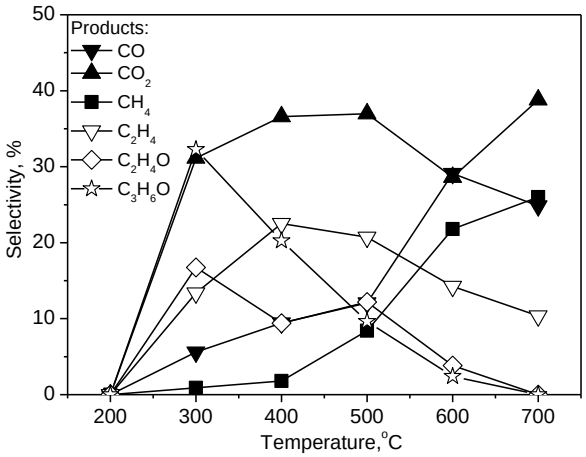

Fig. 12. Selectivity for C-products obtained in the ATR of C_2H_5OH over $Ce_{0.8}La_{0.2}O_{1.9}$ support.

As a rule, with an increase of the reaction temperature the selectivity of C_2H_4O and C_3H_6O formation decreases, selectivity to CO and CH_4 increases, while those of the rest C-product have volcano-type dependence (Fig. 12). In particular, at 600°C Gd_2O_3 and La_2O_3 are noted for high selectivity of C_2H_4 and C_3H_6O formation, respectively, while at 400°C MgO is highly selective to C_2H_4O which is subsequently decomposed to CO и CH_4. Among studied samples the lowest selectivity of ethylene formation is observed over MgO which correlates with its basic properties. In this case the rate of C_2H_5OH dehydrogenation to acetaldehyde is

faster than C_2H_5OH dehydration to ethylene. The C-product distribution over $Ce_{1-x}M_xO_y$ samples lies close to those on CeO_2 at low molar fraction of the dopant. Comparatively large selectivity of C_2-C_3 product formation and relatively low selectivity of CH_4 formation (Fig. 12) indicate that supports have weak capability of breaking C-C bond in ethanol. The introduction of Ni in $Ce_{1-x}M_xO_y$ support changes the material performance in ATR of C_2H_5OH. As follows from Fig. 13a, at low Ni content the composition of products and its temperature dependence are still similar to those in the presence of support. Upon the increase of Ni content from 2 to 15 wt.% the inhibition of formation of ethylene and acetone occurs, as well as promotion of decomposition of acetaldehyde (Fig. 13b, Fig. 14a). So at high Ni content (10-15 wt.%), irrespectively of composition of $Ce_{1-x}M_xO_y$ support (x = 0.1-0.9), at 600^{o}C the amount of these compounds is below detected limit and C-products consist of CH_4 and carbon oxides only (Fig. 13b, Tables 2). It is noted that in this case, the high yield of methane is already observed at low values of reaction temperature and it decreases with a growth of reaction temperature (Fig. 13b). Dependence of Y_{CH4} and Y_{CO} vs. temperature shows the increase of contribution of methane steam reforming reaction with increasing of reaction temperature. The comparison of the obtained product yields over 10Ni catalyst (Fig. 13b) with thermodynamic equilibrium yields (Fig. 13d) shows that these values are close to each other. On the contrary, at low Ni content the significant deviation is observed (Fig. 13a, Fig. 13d). It means that in this case the reaction studied is far from the equilibrium state and it is controlled by kinetic limitations.

The increase of Ni content also leads to a decrease of temperature of complete ethanol conversion and an increase of hydrogen yield (Fig. 13, Fig. 14b). In particular, over $Ni/Ce_{0.8}La_{0.2}O_{1.9}$ catalyst upon the increase of Ni content from 2 to 15 wt.% X_{C2H5OH} decreases from 700 to 300^{o}C (Fig. 13) while Y_{H2} at 600^{o}C grows from 15 to 60% (Fig. 14b). The performance of samples with 10 and 15 wt.% Ni is comparable and 10 wt.% Ni may be regarded as appropriate content for high catalyst performance in the studied reaction. In general the optimal Ni content depends on support composition and reaction conditions. For example, the 30 wt.% Ni is selected as optimal value for Ni/CeO_2-ZrO_2 catalysts for SR of C_2H_5OH. It can be seen (Fig. 14b) that the best hydrogen yield in ATR of C_2H_5OH is achieved in the presence of Ni catalysts on the basis of $Ce_{0.8}La_{0.2}O_{1.9}$ support while the least activity was shown by the catalysts based on $Ce_{0.8}Mg_{0.2}O_{1.8}$ support. These $10Ni/Ce_{0.8}M_{0.2}O_y$ samples have a similar average size of NiO particles (Fig. 11) but different ability in reduction (Fig. 10) that consequently can affect the catalyst performance (Fig. 14b).

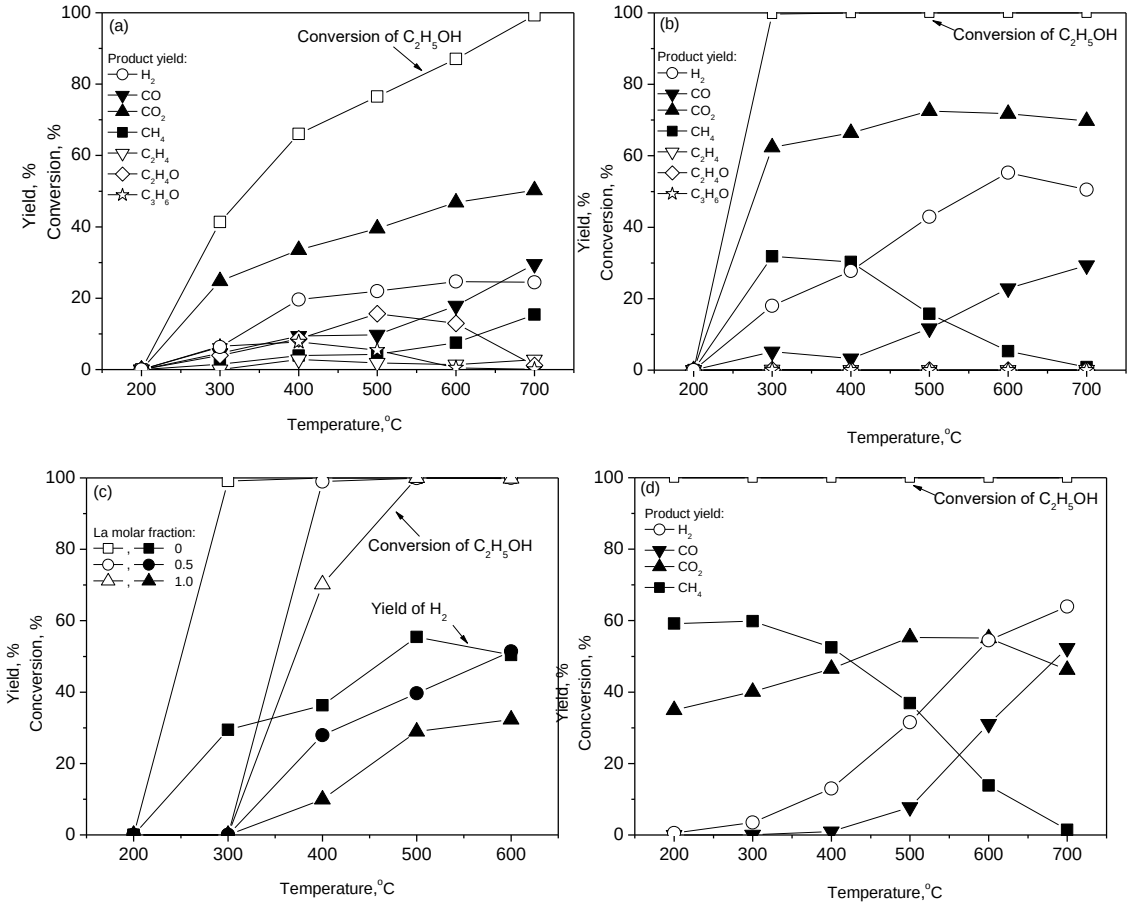

Fig. 13. Ethanol conversion and yield of products obtained in the ATR of C_2H_5OH over $2Ni/Ce_{0.8}La_{0.2}O_{1.9}$ (a), $10Ni/Ce_{0.8}La_{0.2}O_{1.9}$ (b), $10Ni/Ce_{1-x}La_xO_y$ (c) and thermodynamic equilibrium values (d).

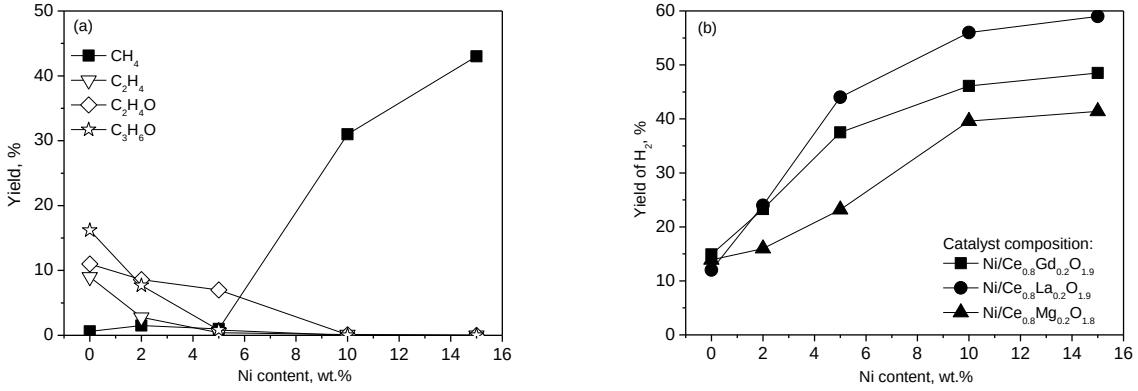

Fig. 14. Effect of Ni content on the yield of products obtained in the ATR of C_2H_5OH over $Ni/Ce_{0.8}La_{0.2}O_{1.9}$ (a) and $Ni/Ce_{0.8}M_{0.2}O_{1.9}$ (b) catalysts. Reaction temperature - 300°C (a), 600°C (b).

At high Ni content (10-15 wt.%) the features of the supports own activity in the reaction is mainly exhibited by catalysts on the individual oxides while the performance of catalysts on mixed oxides differs more strongly in the low-temperature region of the reaction. In this case dopant type and content have impact on catalyst performance mainly through regulation of active component properties. The optimal value of molar fraction depends on the dopant type (Fig. 15). For example, with a decrease of molar fraction of lanthanum in the support, the temperature dependence of the hydrogen yield shifts to the low-temperature region, and the yield of hydrogen increases (Fig. 13c, Table 2). This correlates with an increase of nickel particle size (Fig. 11) and improvement of reducibility of nickel cations (Fig. 14c). It is in agreement with the findings in earlier reports.

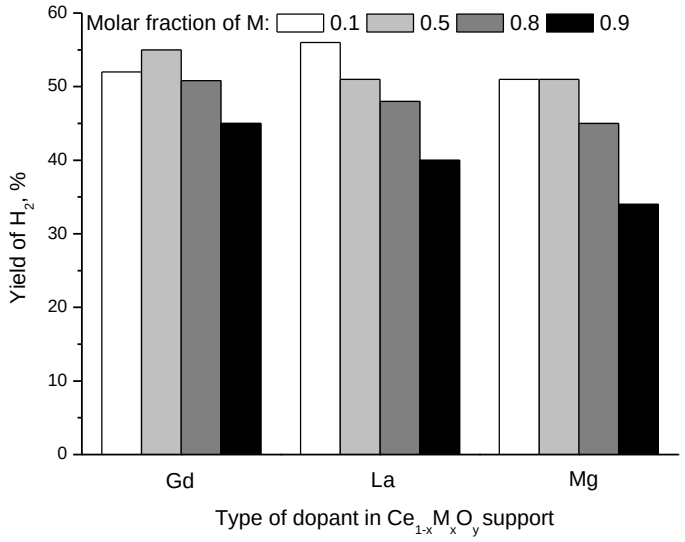

Fig. 15. Effect of support composition on the H_2 yield in the ATR of C_2H_5OH at 600°C over $10Ni/Ce_{1-x}M_xO_y$ catalysts.

Table 2: Effect of La molar fraction on performance of $10Ni/Ce_{1-x}La_xO_y$ catalysts in ATR of C_2H_5OH at 600°C

$Ni/Ce_{1-x}La_xO_y$	X_{C2H50H}	Y_{H2}	Y_{CO}	Y_{CO2}	Y_{CH4}
x = 0	100	50	24	71	5
x = 0.1	100	56	45	54	1
x = 0.2	100	56	33	64	4
x = 0.5	100	51	32	66	1
x = 0.8	100	48	23	66	11
x = 0.9	100	40	20	69	11
x = 1	100	32	19	70	11

Fig. 16 summarizes the relationship between the NiO particle size, reducibility of Ni^{n+} cations and performance of Ni-catalysts in ATR of C_2H_5OH. The variation of $Ce_{1-x}La_xO_y$ support composition leads to change of degree of interaction between Ni active component and support. The increase of metal-support interaction appears as change in form of stabilization of Ni-containing phase and temperature (T) of Ni^{n+} reduction: at x = 0-0.2 → NiO (13-25 nm) →T= 470-500^{o}C, at x = 0.5-0.8 → NiO (< 8 nm) → T= 540-580^{o}C and at x = 0.9-1 → $LaNiO_3$ → T= 650^{o}C. As the strength of metal-support interaction increases, an increase in the dispersion and stability against sintering of the active component is observed. This has a positive effect on the hydrogen yield. However, the reducibility of nickel cations worsen, which, on the contrary, negatively affects the catalyst performance because of less concentration of Ni^o active sites under reaction conditions. In this connection, a volcano-type dependence of the hydrogen yield on the degree of metal-support interaction is observed. It is reported that both the moderate metal-support interaction and the right ability to be reduced contribute to the high performance of $Ni/Mg_{0.75}Ti_{0.25}O$ and $Ni/Mg_{0.5}Ti_{0.5}O$ catalysts in tri-reforming of methane. So, yield of H_2 can be controlled by the selection of the support providing appropriate strength of metal-support interaction. It is expected that long-term stability should be enhanced with growth of degree of metal-support interaction that is a subject of our next study.

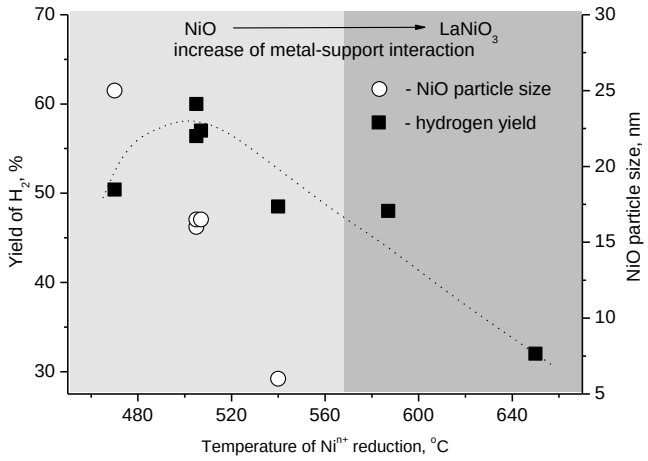

Fig. 16. Relationship between the NiO particle size, reducibility of Ni^{n+} cations and performance of $10Ni/Ce_{1-x}La_xO_y$ catalysts in ATR of C_2H_5OH.

The developed catalyst shows the stable performance in ATR of C_2H_5OH (Fig. 17). It is noted that these experiments were conducted without pre-reduction of catalysts. The data of Fig. 17 indicates that catalysts are capable of self-activation. The samples are reduced under reaction mixture that provides the formation of Ni^o active sites. The decrease of reducibility of Ni^{n+} cations in $10Ni/Ce_{1-x}La_xO_y$ in comparison to those in $10Ni/CeO_2$ leads to appearance of induction period of reaction.

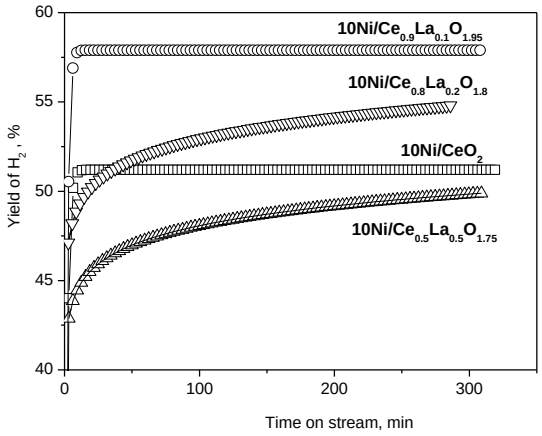

Fig. 17. Catalytic activity of $10Ni/Ce_{1-x}La_xO_y$ catalysts in the ATR of C_2H_5OH versus time on stream at 600^oC.

Our catalysts produce up to 3.5 mol of H_2/mol of ethanol. This is a good result compared with published data, according to which the hydrogen yield is varied from 2.1 to 4.5 mol of H_2/mol of ethanol. At 600^oC the $10Ni/Ce_{0.8}La_{0.2}O_{1.9}$ catalyst provides stable yield of hydrogen (~ 50%) at full ethanol conversion (~100%), which is close to estimated thermodynamic values, confirming its good potential for hydrogen production.

11. Conclusions summarizing the achievements and indication of scope for future work:

Nickel catalysts on $Ce_{1-x}M_xO_y$ supports were prepared and their physicochemical and catalytic properties in ATR of C_2H_5OH were studied against Ni content (0-15 wt.%) and composition of $Ce_{1-x}M_xO_y$ support (M = Gd, La, Mg).

Irrespectively of support composition, the increase of Ni content up to 10-15 wt.% provides increase of H_2 yield and decrease of C_2-C_3-products yield. At low nickel content

support composition determines the selectivity of by-products formation, especially in low-temperature region.

The rising of dopant content in $Ce_xM_{1-x}O_y$ solid solution induces the decrease of its crystallite size and intensifies the Ni-support interaction. It causes improvement of Ni dispersion but decreases Ni^{n+} cation reducibility. The growth of H_2 yield in ATR of C_2H_5OH over $Ni/Ce_{1-x}M_xO_y$ catalysts is observed in the following sequence of dopants: Mg < Gd < La or with a decrease of molar fraction of dopant up to an optimal value that correlates with enhancement of active component reducibility.

12. S&T benefits accrued

i. List of Research publications

S No	Authors	Title of the paper	Name of the Journal	Volume	Pages	Year
1	E.V. Matus, A.S. Shlyakhtina, O.B. Sukhova, I.Z. Ismagilov, V.A. Ushakov, S.A. Yashnik, A.P. Nikitin, P. Bharali, M.A. Kerzhentsev, Z.R. Ismagilov	Effects of preparation methods on the physicochemical and functional properties of Ni/CeO_2 catalysts	Kinetics and Catalysis	19	221-230	2019
2	M.A. Kerzhentsev, E.V. Matus, I.Z. Ismagilov, O.B. Sukhova, P. Bharali, Z.R. Ismagilov	Control of $Ni/Ce_{1-x}M_xO_y$ Catalyst Properties Via the Selection of Dopant M = Gd, La, Mg. Part 1. Physicochemical Characteristics	Eurasian Chemico-Technological Journal	20	283-291	2018
3	M.A. Kerzhentsev, E.V. Matus, I.Z. Ismagilov, O.B. Sukhova, P. Bharali, Z.R. Ismagilov	Control of $Ni/Ce_{1-x}M_xO_y$ catalyst properties via the selection of dopant M = Gd, La, Mg. Part 2. Catalytic activity	Eurasian Chemico-Technological Journal	20	293-300	2018

4	M.A. Kerzhentsev, E.V. Matus, I.Z. Ismagilov, V.A. Ushakov, O.A. Stonkus, T.V. Larina, G.S. Kozlova, P. Bharali, Z.R. Ismagilov	Structural and morphological properties of $Ce_{1-x}M_xO_y$ (M= Gd, La, Mg) supports for the catalysts of autothermal ethanol conversion	Journal of Structural Chemistry	58	126-134	2017

ii. Manpower trained on the project

a) Research Scientists or Research Associates NIL

b) No. of Ph.D. produced Two (Degree awarded)

c) Other Technical Personnel trained NIL

iii. Patents taken, if any NIL

13. Financial Position:

No	Financial Position/ Budget Head	Funds Sanctioned	Expenditure	% of Total cost
I	Salaries/ Manpower costs	3,30,000	3,26,200	98.85
II	Equipment	NIL	NA	NA
III	Supplies & Materials	1,95,355	1,89,423	96.96
IV	Contingencies	2,00,000	1,99,846	99.92
V	Travel	11,78,000	3,62,669	30.79
VI	Overhead Expenses	2,00,350	2,00,350	100
VII	Others, if any /Interest	1,00,055	NA	NA
	Total	22,03,760	12,78,488	

14. Procurement/ Usage of Equipment Not applicable

a) Not applicable

S No	Name of Equipment	Make/Model	Cost (FE/ Rs)	Date of Installation	Utilization Rate (%)	Remarks regarding maintenance/

b) Plans for utilizing the equipment facilities in future Not applicable

Name and Signature with Date:

a. Dr. Pankaj Bharali

(Principal Investigator)

b. Not applicable

(Co-Investigator)

GFR 12 – A

[(SEE RULE 238 (1)]

FORM OF UTILIZATION CERTIFICATE FOR THE GRANTEE ORGANIZATION INCLUDING AUTONOMOUS ORGANIZATIONS

UTILIZATION CERTIFICATE FOR THE YEAR..2015-2016.....
(period ending 31st March 2016)
In respect of recurring/non-recurring
GRANT-IN-AID/SALARIES/CREATION OF CAPITAL ASSETS

1. Name of the scheme — Principles of formation of nanostructured oxide materials and nanosized catalysts on their basis for hydrogen power production applications (DST-RFBR)
2. Whether recurring or non-recurring grants — Recurring
3. Grants position at the beginning of the financial year
   - (i) Cash in Hand/Bank — NIL
   - (ii) Unadjusted advances — NIL
   - (iii) Total — NIL

4. Details of grants received, expenditure incurred and closing balances: (Actuals)

Unspent Balances of Grants received year [figure as at Sl No 3(iii)]	Interest earned thereon	Interest deposited back to the government	Grant received during the year			Total Available funds (1+2-3+4)	Expenditure incurred	Closing Balance (5-6)
1	2	3	4			5	6	7
			Sanction no. (i)	Date (ii)	Amount (iii)			
NIL	6904/-	NIL	INT/RUS/RFBR/P-189	05.08.2015	11,01,320/-	11,08,224/-	7,50,129/-	3,58,095/-

5. Component wise utilization of grants:

Grants-in-aid-General	Grant-in-aid -Salary	Grants-in-aid-creation of capital	Total
6,62,396/-	87,733/-	NIL	7,50,129/-

6. Details of grants position at end of the year
   - (i) Cash in Hand /Bank — 3,58,095/-
   - (ii) Unadjusted Advance — NIL
   - (iii) Total — 3,58,095/-

7. Certified that I have satisfied myself that the conditions on which grants were sanctioned have been duly fulfilled /are being fulfilled and that I have exercised following checks to see that the money has been actually utilized for the purpose for which it was sanctioned:

(i) The main accounts and other subsidiary accounts and registers (including assets register) are maintained as prescribed in the relevant Act/Rules/standing instructions (mention the Act/Rules)

and have been duly audited by designated auditors. The figures depicted above tally with the audited figures mentioned in financial statements/accounts.

(ii) There exist internal controls for safeguarding public funds/assets, watching outcomes and achievements of physical targets against the financial inputs, ensuring quality in asset creation etc. & the periodic evaluation of internal controls is exercised to ensure their effectiveness.

(iii) To the best of our knowledge and belief, no transactions have been entered that are in violation of relevant Act/Rules/standing instructions and scheme guidelines.

(iv) The responsibilities among the key functionaries for execution of the scheme have been assigned in clear terms and are not general in nature.

(v) The benefits were extended to the intended beneficiaries and only such areas/districts were covered where the scheme was intended to operate.

(vi) The expenditure on various components of the scheme was in the proportions authorized as per the scheme guidelines and terms and conditions of the grants-in-aid.

(vii) It has been ensured that the physical and financial performance under.....(name of the scheme has been according to the requiements, as prescribed in the guidelines issued by Govt. of India and the performance/targets achieved statement for the year to which the utilization of the fund resulted in outcomes give at Annexure- I duly enclosed.

(viii) The utilization of the fund resulted in outcomes given at Annexure – II duly enclosed (to be formulated by the Ministry /Department concerned as per their requirements/specifications.)

(ix) Details of various schemes executed by the agency through grants-in-aid received from the same Ministry or from other Ministries is enclosed at Annexure—II (to be formulated by the Ministry/Department concerned as per their requirements/specifications).

Date:

Place:

Signature

Name
Chief Finance Officer
(Head of the Finance)
Finance Officer
Tezpur University

Signature

Name
Head of the Organisation
Registrar
Tezpur University

(TO BE FILLED IN BY DST)

2. Certified that I have satisfied myself that the conditions on which the grants-in-aid was sanctioned have been fulfilled/are being fulfilled and that I have exercised the following checks to see that the money was actually utilised for the purpose for which it was sanctioned:

Kinds of checks exercised.

1.
2.
3.
4.
5.

Signature
Designation
Date

Annexure - II

REQUEST FOR ANNUAL INSTALLMENT WITH UP-TO-DATE STATEMENT OF EXPENDITURE

(Year Means Financial Year i.e.. 1 st April to 31 st March of Next Year)

1. Sanction Letter No. INT/RUS/RFBR/P-189
2. Total Project Cost Rs. 24,61,800/-
3. Sanctioned/Revised project cost (if applicable) Rs. None
4. Date of commencement of Project 02.09.2015
5. Statement of Expenditure

6. Grant Received in each year:
   a. I year Rs . 11,01,320/-
   b. II year Rs.
   c. III year Rs.
   d. Interest, if any Rs. 6,904/-
   e. Total Rs. 11,08,224/-

Month **Year**

Month & Year	Expenditure incurred/ committed
October 2015	12,023
November 2015	14,000 + 3,733 + 8,486 + 5,143 = 31,362
December 2015	14,000
January 2016	14,000 + 62,575 + 12,379 = 88,954
February 2016	14,000 + 29,999 + 13,316 = 57,315
March 2016	29,688 + 15,458 + 7,576 + 87,735 + 7,546 + 28,000 + 7,803 + 3,62,669 = 5,46,475
Total	**7,50,129**

Note:

1. Expenditure under the sanctioned heads, at any point of time, should not exceed funds allocated under the head, without prior approval of DST i.e. Figures in Column (vii) should not exceed corresponding figures in Column (iii)
2. Utilisation Certificate for each financial year ending 31st March has to be enclosed, along with request for carry-forward permission to next year

Annexure IInd Continued

Sl. No.	Sanctioned Heads**	Funds Allocated (*)	Expenditure Incurred				Balance as on date (Col. iii - vii)	Required Funds till 31 March	Remarks (if any)
			I Yr.	II Yr.	III Yr.	Total (iv+v+vi)			
i.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.	x.
1.	Salaries	3,30,000	87,733	NA	NA	87,733	2,42,267	3,30,000	
2.	Permanent Equipments	NIL	-	-	-	-	-	-	
3.	Supplies & Materials/consumables	1,00,000	99,758	-	-	99,758	242	1,00,000	
4.	Travel of Indian Scientists Abroad	4,71,200	3,62,669	-	-	3,62,669	1,08,531	7,06,800	
5.	Hospitality of Foreign Scientists - Per diem @ Rs._____ - Accommodation	NA	-	-	-	-	-	-	
6.	Contingencies	1,00,000	99,849	-	-	99,849	151	1,00,000	
7.	Overhead Expenses	1,00,120	1,00,120			1,00,120	0	1,23,680	
8.	Interest earned	6,904	-	-	-	-	6,904	-	
	Total	11,08,224	7,50,129	-	-	7,50,129	3,58,095	13,60,480	

*Note : * Please indicate heads and allocation as per original / revised (if any) sanction order approving/ revising the project*

Name & Signature
Principal Investigator: Dr. Pankaj Bhanali
Date: 6/2/2019

Signature of Competent financial authority
Date:
Finance Officer
Tezpur University

GFR 12 – A

[(SEE RULE 238 (1)]

FORM OF UTILIZATION CERTIFICATE FOR THE GRANTEE ORGANIZATION INCLUDING AUTONOMOUS ORGANIZATIONS

UTILIZATION CERTIFICATE FOR THE YEAR..2016-2017.....
(period ending 31st March 2017)
In respect of recurring/non-recurring
GRANT-IN-AID/SALARIES/CREATION OF CAPITAL ASSETS

1. Name of the scheme — Principles of formation of nanostructured oxide materials and nanosized catalysts on their basis for hydrogen power production applications (DST-RFBR)
2. Whether recurring or non-recurring grants — Recurring
3. Grants position at the beginning of the financial year
   - (i) Cash in Hand/Bank — 3,58,095/-
   - (ii) Unadjusted advances — NIL
   - (iii) Total — 3,58,095/-

4. Details of grants received, expenditure incurred and closing balances: (Actuals)

Unspent Balances of Grants received year [figure as at Sl No 3(iii)]	Interest earned thereon	Interest deposited back to the government	Grant received during the year			Total Available funds (1+2-3+4)	Expenditure incurred	Closing Balance (5-6)
1	2	3	4			5	6	7
			Sanction no. (i)	Date (ii)	Amount (iii)			
3,58,095/-	15/-	NIL	-	-	NIL	3,58,110/-	3,57,662/-	448/-

5. Component wise utilization of grants:

Grants-in-aid-General	Grant-in-aid -Salary	Grants-in-aid-creation of capital	Total
1,89,662/-	1,68,000/-	NIL	3,57,662/-

6. Details of grants position at end of the year
   - (i) Cash in Hand /Bank — 448/-
   - (ii) Unadjusted Advance — NIL
   - (iii) Total — 448/-

7. Certified that I have satisfied myself that the conditions on which grants were sanctioned have been duly fulfilled /are being fulfilled and that I have exercised following checks to see that the money has been actually utilized for the purpose for which it was sanctioned:

(i) The main accounts and other subsidiary accounts and registers (including assets register) are maintained as prescribed in the relevant Act/Rules/standing instructions (mention the Act/Rules)

and have been duly audited by designated auditors. The figures depicted above tally with the audited figures mentioned in financial statements/accounts.

(ii) There exist internal controls for safeguarding public funds/assets, watching outcomes and achievements of physical targets against the financial inputs, ensuring quality in asset creation etc. & the periodic evaluation of internal controls is exercised to ensure their effectiveness.

(iii) To the best of our knowledge and belief, no transactions have been entered that are in violation of relevant Act/Rules/standing instructions and scheme guidelines.

(iv) The responsibilities among the key functionaries for execution of the scheme have been assigned in clear terms and are not general in nature.

(v) The benefits were extended to the intended beneficiaries and only such areas/districts were covered where the scheme was intended to operate.

(vi) The expenditure on various components of the scheme was in the proportions authorized as per the scheme guidelines and terms and conditions of the grants-in-aid.

(vii) It has been ensured that the physical and financial performance under.....(name of the scheme has been according to the requiements, as prescribed in the guidelines issued by Govt. of India and the performance/targets achieved statement for the year to which the utilization of the fund resulted in outcomes give at Annexure- I duly enclosed.

(viii) The utilization of the fund resulted in outcomes given at Annexure – II duly enclosed (to be formulated by the Ministry /Department concerned as per their requirements/specifications.)

(ix) Details of various schemes executed by the agency through grants-in-aid received from the same Ministry or from other Ministries is enclosed at Annexure—II (to be formulated by the Ministry/Department concerned as per their requirements/specifications).

Date:

Place:

Signature

Name
Chief Finance Officer
(Head of the Finance)
Finance Officer
Tezpur University

Signature

Name
Head of the Organisation
Registrar
Tezpur University

(TO BE FILLED IN BY DST)

2. Certified that I have satisfied myself that the conditions on which the grants-in-aid was sanctioned have been fulfilled/are being fulfilled and that I have exercised the following checks to see that the money was actually utilised for the purpose for which it was sanctioned:

Kinds of checks exercised.

1.
2.
3.
4.
5.

Signature
Designation
Date

Annexure - II

REQUEST FOR ANNUAL INSTALLMENT WITH UP-TO-DATE STATEMENT OF EXPENDITURE

(Year Means Financial Year i.e.. 1 st April to 31 st March of Next Year)

1. Sanction Letter No. INT/RUS/RFBR/P-189
2. Total Project Cost Rs. 24,61,800/-
3. Sanctioned/Revised project cost (if applicable) Rs. None
4. Date of commencement of Project 02.09.2015
5. Statement of Expenditure

6. Grant Received in each year:
   a. I year Rs . 11,01,320/-
   b. II year Rs. NIL
   c. III year Rs.
   d. Interest, if any Rs. 6,904/- + 15/-
   e. Total Rs. 11,08,239/-

Month **Year**

Month & Year	Expenditure incurred/ committed
March 2016	14,000
April 2016	14,000
May 2016	14,000
June 2016	14,000
July 2016	14,000
August 2016	14,000
September 2016	14,000
October 2016	14,000
November 2016	14,000
December 2016	14,000+18,084 = 32,084
January 2017	14,000+9,532+9,500+10,350 = 43,382
February 2017	14,000
March 2017	14,000+28,000+10,084+5,314+66,267+32,531= 1,56,196
Total	**3,57,662**

Note:

1. Expenditure under the sanctioned heads, at any point of time, should not exceed funds allocated under the head, without prior approval of DST i.e. Figures in Column (vii) should not exceed corresponding figures in Column (iii)
2. Utilisation Certificate for each financial year ending 31st March has to be enclosed, along with request for carry-forward permission to next year

Annexure IInd Continued

Sl. No.	Sanctioned Heads**	Funds Allocated (*)	Expenditure Incurred				Balance as on date (Col. iii - vii)	Required Funds till 31 March	Remarks (if any)
			I Yr.	II Yr.*	III Yr.	Total (iv+v+vi)			
i.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.	x.
1.	Salaries	3,30,000	87,733	1,68,000	NA	2,55,773	-	3,30,000	
2.	Permanent Equipments	NIL	-	-	-	-	-	-	
3.	Supplies & Materials/consumables	1,00,000	99,758	89,665	-	1,89,423	430	1,00,000	
4.	Travel of Indian Scientists Abroad	4,71,200	3,62,669	-	-	3,62,669	-	7,06,800	
5.	Hospitality of Foreign Scientists - Per diem @ Rs._____ - Accommodation	NA	-	-	-	-	-	-	
6.	Contingencies	1,00,000	99,849	99,997	-	1,99,846	3	1,00,000	
7.	Overhead Expenses	1,00,120	1,00,120	-	-	1,00,120	0	1,23,680	
8.	Interest earned	6919	-	-	-	-	15	-	
	Total	11,08,239	7,50,129	3,57,662*	-	11,07,791	448	13,60,480	

Note : * The 2nd year expenses were made utilizing the carry forward amount of 2015-2016 distributed to meet the expenses of Manpower, Consumable and Contingency as per rule. We did not receive grant in 2016-2017.

Name & Signature
Principal Investigator: Dr. Pankaj Bharali
Date: 6/2/2019

Signature of Competent financial authority
Date:
Finance Officer
Tezpur University

GFR 12 – A

[(SEE RULE 238 (1)]

FORM OF UTILIZATION CERTIFICATE FOR THE GRANTEE ORGANIZATION INCLUDING AUTONOMOUS ORGANIZATIONS

UTILIZATION CERTIFICATE FOR THE YEAR..2017-2018.....
(period ending 31st March 2018)
In respect of recurring/non-recurring
GRANT-IN-AID/SALARIES/CREATION OF CAPITAL ASSETS

1. Name of the scheme — Principles of formation of nanostructured oxide materials and nanosized catalysts on their basis for hydrogen power production applications (DST-RFBR)
2. Whether recurring or non-recurring grants — Recurring
3. Grants position at the beginning of the financial year
   - (i) Cash in Hand/Bank — 448/-
   - (ii) Unadjusted advances — NIL
   - (iii) Total — 448/-

4. Details of grants received, expenditure incurred and closing balances: (Actuals)

Unspent Balances of Grants received year [figure as at Sl No 3(iii)]	Interest earned thereon	Interest deposited back to the government	Grant received during the year			Total Available funds (1+2-3+4)	Expenditure incurred	Closing Balance (5-6)
1	2	3	4			5	6	7
			Sanction no. (i)	Date (ii)	Amount (iii)			
448/-	13/-	NIL	INT/RUS/RFBR/P-189	23.10.2017	10,02,385/-	10,02,846/-	1,70,697/-	8,32,149/-

5. Component wise utilization of grants:

Grants-in-aid-General	Grant-in-aid -Salary	Grants-in-aid-creation of capital	Total
1,00,230/-	70,467/-	NIL	1,70,697/-

6. Details of grants position at end of the year
   - (i) Cash in Hand /Bank — 8,32,149/-
   - (ii) Unadjusted Advance — NIL
   - (iii) Total — 8,32,149/-

7. Certified that I have satisfied myself that the conditions on which grants were sanctioned have been duly fulfilled /are being fulfilled and that I have exercised following checks to see that the money has been actually utilized for the purpose for which it was sanctioned:

(i) The main accounts and other subsidiary accounts and registers (including assets register) are maintained as prescribed in the relevant Act/Rules/standing instructions (mention the Act/Rules)

and have been duly audited by designated auditors. The figures depicted above tally with the audited figures mentioned in financial statements/accounts.

(ii) There exist internal controls for safeguarding public funds/assets, watching outcomes and achievements of physical targets against the financial inputs, ensuring quality in asset creation etc. & the periodic evaluation of internal controls is exercised to ensure their effectiveness.

(iii) To the best of our knowledge and belief, no transactions have been entered that are in violation of relevant Act/Rules/standing instructions and scheme guidelines.

(iv) The responsibilities among the key functionaries for execution of the scheme have been assigned in clear terms and are not general in nature.

(v) The benefits were extended to the intended beneficiaries and only such areas/districts were covered where the scheme was intended to operate.

(vi) The expenditure on various components of the scheme was in the proportions authorized as per the scheme guidelines and terms and conditions of the grants-in-aid.

(vii) It has been ensured that the physical and financial performance under.....(name of the scheme has been according to the requiements, as prescribed in the guidelines issued by Govt. of India and the performance/targets achieved statement for the year to which the utilization of the fund resulted in outcomes give at Annexure- I duly enclosed.

(viii) The utilization of the fund resulted in outcomes given at Annexure – II duly enclosed (to be formulated by the Ministry /Department concerned as per their requirements/specifications.)

(ix) Details of various schemes executed by the agency through grants-in-aid received from the same Ministry or from other Ministries is enclosed at Annexure—II (to be formulated by the Ministry/Department concerned as per their requirements/specifications).

Date:

Place:

Signature

Name
Chief Finance Officer
(Head of the Finance)

Finance Officer
Tezpur University

Signature

Name
Head of the Organisation

Registrar
Tezpur University

(TO BE FILLED IN BY DST)

2. Certified that I have satisfied myself that the conditions on which the grants-in-aid was sanctioned have been fulfilled/are being fulfilled and that I have exercised the following checks to see that the money was actually utilised for the purpose for which it was sanctioned:

Kinds of checks exercised.

1.
2.
3.
4.
5.

Signature
Designation
Date

Annexure - II

REQUEST FOR ANNUAL INSTALLMENT WITH UP-TO-DATE STATEMENT OF EXPENDITURE

(Year Means Financial Year i.e.. 1 st April to 31 st March of Next Year)

1. Sanction Letter No. INT/RUS/RFBR/P-189
2. Total Project Cost Rs. 24,61,800/-
3. Sanctioned/Revised project cost (if applicable) Rs. None
4. Date of commencement of Project 02.09.2015
5. Statement of Expenditure

6. Grant Received in each year:
   a. I year Rs . 11,01,320/-
   b. II year Rs. 10,02,385/-
   c. III year Rs. NIL
   d. Interest, if any Rs. 6,904/- + 15/- +13/-
   e. Total Rs. 21,10,637/-

Month **Year**

Month & Year	Expenditure incurred/ committed
March 2018	70,467 + 1,00,230 = 1,70,697
Total	**1,70,697**

Note:

1. Expenditure under the sanctioned heads, at any point of time, should not exceed funds allocated under the head, without prior approval of DST i.e. Figures in Column (vii) should not exceed corresponding figures in Column (iii)
2. Utilisation Certificate for each financial year ending 31st March has to be enclosed, along with request for carry-forward permission to next year

Annexure IInd Continued

Sl. No.	Sanctioned Heads**	Funds Allocated (*)	Expenditure Incurred				Balance as on date (Col. iii - vii)	Required Funds till 31 March	Remarks (if any)
			I Yr.	II Yr.*	III Yr.	Total (iv+v+vi)			
i.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.	x.
1.	Salaries	3,30,000	87,733	1,68,000	70,467	3,26,200	3,800	-	
2.	Permanent Equipments	NIL	-	-	-	-	-	-	
3.	Supplies & Materials/consumables	1,00,000+ 95,355	99,758	89,665	-	1,89,423	5,932	-	
4.	Travel of Indian Scientists Abroad	4,71,200+ 7,06,800	3,62,669	-	-	3,62,669	8,15,331	-	
5.	Hospitality of Foreign Scientists - Per diem @ Rs._____ - Accommodation	NA	-	-	-	-	-	-	
6.	Contingencies	1,00,000+ 1,00,000	99,849	99,997	-	1,99,846	154	-	
7.	Overhead Expenses	1,00,120+ 1.00,230	1,00,120	-	1,00,230	2,00,350	0	-	
8.	Interest earned	6,932	-	-	-	-	6,932	-	
	Total	21,10,637	7,50,129	3,57,662*	1,70,697	12,78,488	8,32,149	-	

Note : * The 2nd year expenses were made utilizing the carry forward amount of 2015-2016 distributed to meet the expenses of Manpower, Consumable and Contingency as per rule. We did not receive 2nd instalment on time. Later on submission of PCR, it was intimated by DST that it was disbursed without any SO or intimation and asked to revise the UC/SE. However, it took long time to get SO. Immediately after that lockdown started and the process was delayed. The 2nd instalment was received only on 03/11/2017, i.e. after completion of project.

Name & Signature
Principal Investigator: Dr. Pankaj Bharali.
Date: 26/04/2023

Signature of Competent financial authority
Date: 17/4/2023
Finance Officer
Tezpur University

GFR 12 – A

[(SEE RULE 238 (1)]

FORM OF UTILIZATION CERTIFICATE FOR THE GRANTEE ORGANIZATION INCLUDING AUTONOMOUS ORGANIZATIONS

UTILIZATION CERTIFICATE FOR THE YEAR..2018-2019.....
(period ending 31st March 2019)
In respect of recurring/non-recurring
GRANT-IN-AID/SALARIES/CREATION OF CAPITAL ASSETS

1. Name of the scheme — Principles of formation of nanostructured oxide materials and nanosized catalysts on their basis for hydrogen power production applications (DST-RFBR)
2. Whether recurring or non-recurring grants — Recurring
3. Grants position at the beginning of the financial year
   - (i) Cash in Hand/Bank — 8,32,149/-
   - (ii) Unadjusted advances — NIL
   - (iii) Total — 8,32,149/-

4. Details of grants received, expenditure incurred and closing balances: (Actuals)

Unspent Balances of Grants received year [figure as at Sl No 3(iii)]	Interest earned thereon	Interest deposited back to the government	Grant received during the year			Total Available funds (1+2-3+4)	Expenditure incurred	Closing Balance (5-6)
1	2	3	4			5	6	7
			Sanction no. (i)	Date (ii)	Amount (iii)			
8,32,149/-	25,060/-	NIL	-	-	-	8,57,209/-	NIL	8,57,209/-

5. Component wise utilization of grants:

Grants-in-aid-General	Grant-in-aid -Salary	Grants-in-aid-creation of capital	Total
NIL	NIL	NIL	NIL

6. Details of grants position at end of the year
   - (i) Cash in Hand /Bank — 8,57,209/-
   - (ii) Unadjusted Advance — NIL
   - (iii) Total — 8,57,209/-

7. Certified that I have satisfied myself that the conditions on which grants were sanctioned have been duly fulfilled /are being fulfilled and that I have exercised following checks to see that the money has been actually utilized for the purpose for which it was sanctioned:

(i) The main accounts and other subsidiary accounts and registers (including assets register) are maintained as prescribed in the relevant Act/Rules/standing instructions (mention the Act/Rules)

and have been duly audited by designated auditors. The figures depicted above tally with the audited figures mentioned in financial statements/accounts.

(ii) There exist internal controls for safeguarding public funds/assets, watching outcomes and achievements of physical targets against the financial inputs, ensuring quality in asset creation etc. & the periodic evaluation of internal controls is exercised to ensure their effectiveness.

(iii) To the best of our knowledge and belief, no transactions have been entered that are in violation of relevant Act/Rules/standing instructions and scheme guidelines.

(iv) The responsibilities among the key functionaries for execution of the scheme have been assigned in clear terms and are not general in nature.

(v) The benefits were extended to the intended beneficiaries and only such areas/districts were covered where the scheme was intended to operate.

(vi) The expenditure on various components of the scheme was in the proportions authorized as per the scheme guidelines and terms and conditions of the grants-in-aid.

(vii) It has been ensured that the physical and financial performance under.....(name of the scheme has been according to the requiements, as prescribed in the guidelines issued by Govt. of India and the performance/targets achieved statement for the year to which the utilization of the fund resulted in outcomes give at Annexure- I duly enclosed.

(viii) The utilization of the fund resulted in outcomes given at Annexure – II duly enclosed (to be formulated by the Ministry /Department concerned as per their requirements/specifications.)

(ix) Details of various schemes executed by the agency through grants-in-aid received from the same Ministry or from other Ministries is enclosed at Annexure—II (to be formulated by the Ministry/Department concerned as per their requirements/specifications).

Date:

Place:

Signature 10/7/23

Name
Chief Finance Officer
(Head of the Finance)

Finance Officer
Tezpur University

Signature 10/7/23

Name
Head of the Organisation

Registrar
Tezpur University

(TO BE FILLED IN BY DST)

2. Certified that I have satisfied myself that the conditions on which the grants-in-aid was sanctioned have been fulfilled/are being fulfilled and that I have exercised the following checks to see that the money was actually utilised for the purpose for which it was sanctioned:

Kinds of checks exercised.

1.
2.
3.
4.
5.

Signature
Designation
Date

Annexure - II

REQUEST FOR ANNUAL INSTALLMENT WITH UP-TO-DATE STATEMENT OF EXPENDITURE

(Year Means Financial Year i.e.. 1 st April to 31 st March of Next Year)

1. Sanction Letter No. INT/RUS/RFBR/P-189
2. Total Project Cost Rs. 24,61,800/-
3. Sanctioned/Revised project cost (if applicable) Rs. None
4. Date of commencement of Project 02.09.2015
5. Statement of Expenditure

6. Grant Received in each year:
   a. I year Rs . 11,01,320/-
   b. II year Rs. 10,02,385/-
   c. III year Rs. NIL
   d. Interest, if any Rs. 6,904/- + 15/- +13/- +25060/-
   e. Total Rs. 21,35,697/-

Month **Year**

Month & Year	Expenditure incurred/ committed
April 2018-March 2019	NIL

Note:

1. Expenditure under the sanctioned heads, at any point of time, should not exceed funds allocated under the head, without prior approval of DST i.e. Figures in Column (vii) should not exceed corresponding figures in Column (iii)
2. Utilisation Certificate for each financial year ending 31st March has to be enclosed, along with request for carry-forward permission to next year

Annexure IInd Continued

Sl. No.	Sanctioned Heads**	Funds Allocated (*)	Expenditure Incurred					Balance as on date (Col. iii - vii)	Required Funds till 31 March	Remarks (if any)
			I Yr.	II Yr.*	III Yr.	IV Yr.	Total (iv+v+vi)			
i.	ii.	iii.	iv.	v.	vi.		vii.	viii.	ix.	x.
1.	Salaries	3,30,000	87,733	1,68,000	70,467	No expense made during these period	3,26,200	3,800	-	
2.	Permanent Equipments	NIL	-	-	-		-	-	-	
3.	Supplies & Materials/consumables	1,00,000+ 95,355	99,758	89,665	-		1,89,423	5,932	-	
4.	Travel of Indian Scientists Abroad	4,71,200+ 7,06,800	3,62,669	-	-		3,62,669	8,15,331	-	
5.	Hospitality of Foreign Scientists - Per diem @ Rs._____ - Accommodation	NA	-	-	-		-	-	-	
6.	Contingencies	1,00,000+ 1,00,000	99,849	99,997	-		1,99,846	154	-	
7.	Overhead Expenses	1,00,120+ 1,00,230	1,00,120	-	1,00,230		2,00,350	0	-	
8.	Interest earned	31,992	-	-	-		-	31,992	-	
	Total	21,35,697	7,50,129	3,57,662*	1,70,697		12,78,488	8,57,209	-	

Note : * The 2nd year expenses were made utilizing the carry forward amount of 2015-2016 distributed to meet the expenses of Manpower, Consumable and Contingency as per rule. We did not receive 2nd instalment on time. Later on submission of PCR, it was intimated by DST that it was disbursed without any SO or intimation and asked to revise the UC/SE. However, it took long time to get SO. Immediately after that lockdown started and the process was delayed. The 2nd instalment was received only on 03/11/2017, i.e. after completion of project.

Name & Signature
Principal Investigator: Dr. Pankaj Bharali
Date: 26/04/2023

Signature of Competent financial authority
Date: 10/4/23
Finance Officer
Tezpur University

GFR 12 – A

[(SEE RULE 238 (1)]

FORM OF UTILIZATION CERTIFICATE FOR THE GRANTEE ORGANIZATION INCLUDING AUTONOMOUS ORGANIZATIONS

UTILIZATION CERTIFICATE FOR THE YEAR..2019-2020.....
(period ending 31st March 2020)
In respect of recurring/non-recurring
GRANT-IN-AID/SALARIES/CREATION OF CAPITAL ASSETS

1. Name of the scheme — Principles of formation of nanostructured oxide materials and nanosized catalysts on their basis for hydrogen power production applications (DST-RFBR)
2. Whether recurring or non-recurring grants — Recurring
3. Grants position at the beginning of the financial year
   - (i) Cash in Hand/Bank — 8,57,209/-
   - (ii) Unadjusted advances — NIL
   - (iii) Total — 8,57,209/-

4. Details of grants received, expenditure incurred and closing balances: (Actuals)

Unspent Balances of Grants received year [figure as at Sl No 3(iii)]	Interest earned thereon	Interest deposited back to the government	Grant received during the year			Total Available funds (1+2-3+4)	Expenditure incurred	Closing Balance (5-6)
1	2	3	4			5	6	7
			Sanction no. (i)	Date (ii)	Amount (iii)			
8,57,209/-	6,289/-	NIL	-	-	-	8,63,498/-	NIL	8,63,498/-

5. Component wise utilization of grants:

Grants-in-aid-General	Grant-in-aid -Salary	Grants-in-aid-creation of capital	Total
NIL	NIL	NIL	NIL

6. Details of grants position at end of the year
   - (i) Cash in Hand /Bank — 8,63,498/-
   - (ii) Unadjusted Advance — NIL
   - (iii) Total — 8,63,498/-

7. Certified that I have satisfied myself that the conditions on which grants were sanctioned have been duly fulfilled /are being fulfilled and that I have exercised following checks to see that the money has been actually utilized for the purpose for which it was sanctioned:

(i) The main accounts and other subsidiary accounts and registers (including assets register) are maintained as prescribed in the relevant Act/Rules/standing instructions (mention the Act/Rules)

and have been duly audited by designated auditors. The figures depicted above tally with the audited figures mentioned in financial statements/accounts.

(ii) There exist internal controls for safeguarding public funds/assets, watching outcomes and achievements of physical targets against the financial inputs, ensuring quality in asset creation etc. & the periodic evaluation of internal controls is exercised to ensure their effectiveness.

(iii) To the best of our knowledge and belief, no transactions have been entered that are in violation of relevant Act/Rules/standing instructions and scheme guidelines.

(iv) The responsibilities among the key functionaries for execution of the scheme have been assigned in clear terms and are not general in nature.

(v) The benefits were extended to the intended beneficiaries and only such areas/districts were covered where the scheme was intended to operate.

(vi) The expenditure on various components of the scheme was in the proportions authorized as per the scheme guidelines and terms and conditions of the grants-in-aid.

(vii) It has been ensured that the physical and financial performance under.....(name of the scheme has been according to the requiements, as prescribed in the guidelines issued by Govt. of India and the performance/targets achieved statement for the year to which the utilization of the fund resulted in outcomes give at Annexure- I duly enclosed.

(viii) The utilization of the fund resulted in outcomes given at Annexure – II duly enclosed (to be formulated by the Ministry /Department concerned as per their requirements/specifications.)

(ix) Details of various schemes executed by the agency through grants-in-aid received from the same Ministry or from other Ministries is enclosed at Annexure—II (to be formulated by the Ministry/Department concerned as per their requirements/specifications).

Date:

Place:

Signature

Name
Chief Finance Officer
(Head of the Finance)

Finance Officer
Tezpur University

Signature

Name
Head of the Organisation

Registrar
Tezpur University

(TO BE FILLED IN BY DST)

2. Certified that I have satisfied myself that the conditions on which the grants-in-aid was sanctioned have been fulfilled/are being fulfilled and that I have exercised the following checks to see that the money was actually utilised for the purpose for which it was sanctioned:

Kinds of checks exercised.

1.
2.
3.
4.
5.

Signature
Designation
Date

Annexure - II

REQUEST FOR ANNUAL INSTALLMENT WITH UP-TO-DATE STATEMENT OF EXPENDITURE

(Year Means Financial Year i.e.. 1 st April to 31 st March of Next Year)

1. Sanction Letter No. INT/RUS/RFBR/P-189
2. Total Project Cost Rs. 24,61,800/-
3. Sanctioned/Revised project cost (if applicable) Rs. None
4. Date of commencement of Project 02.09.2015
5. Statement of Expenditure

6. Grant Received in each year:
   a. I year Rs . 11,01,320/-
   b. II year Rs. 10,02,385/-
   c. III year Rs. NIL
   d. Interest, if any Rs. 6,904/- + 15/- +13/- +25,060/-+ 6,289/-+
   e. Total Rs. 21,41,986/-

Month **Year**

Month & Year	Expenditure incurred/ committed
April 2019-March 2020	NIL

Note:

1. Expenditure under the sanctioned heads, at any point of time, should not exceed funds allocated under the head, without prior approval of DST i.e. Figures in Column (vii) should not exceed corresponding figures in Column (iii)
2. Utilisation Certificate for each financial year ending 31st March has to be enclosed, along with request for carry-forward permission to next year

Annexure IInd Continued

Sl. No.	Sanctioned Heads**	Funds Allocated (*)	Expenditure Incurred					Balance as on date (Col. iii - vii)	Required Funds till 31 March	Remarks (if any)
			I Yr.	II Yr.*	III Yr.	IV-V Yr.	Total (iv+v+vi)			
i.	ii.	iii.	iv.	v.	vi.		vii.	viii.	ix.	x.
1.	Salaries	3,30,000	87,733	1,68,000	70,467	No expense made during these period	3,26,200	3,800	-	
2.	Permanent Equipments	NIL	-	-	-		-	-	-	
3.	Supplies & Materials/consumables	1,00,000+ 95,355	99,758	89,665	-		1,89,423	5,932	-	
4.	Travel of Indian Scientists Abroad	4,71,200+ 7,06,800	3,62,669	-	-		3,62,669	8,15,331	-	
5.	Hospitality of Foreign Scientists - Per diem @ Rs._____ - Accommodation	NA	-	-	-		-	-	-	
6.	Contingencies	1,00,000+ 1,00,000	99,849	99,997	-		1,99,846	154	-	
7.	Overhead Expenses	1,00,120+ 1,00,230	1,00,120	-	1,00,230		2,00,350	0	-	
8.	Interest earned	38,281	-	-	-		-	38,281	-	
	Total	21,41,986	7,50,129	3,57,662*	1,70,697		12,78,488	8,63,498	-	

Note : * The 2nd year expenses were made utilizing the carry forward amount of 2015-2016 distributed to meet the expenses of Manpower, Consumable and Contingency as per rule. We did not receive 2nd instalment on time. Later on submission of PCR, it was intimated by DST that it was disbursed without any SO or intimation and asked to revise the UC/SE. However, it took long time to get SO. Immediately after that lockdown started and the process was delayed. The 2nd instalment was received only on 03/11/2017, i.e. after completion of project.

Name & Signature
Principal Investigator: Dr. Pankaj Bharali
Date: 26/04/2023

Signature of Competent financial authority
Date: 10/7/2023

Finance Officer
Tezpur University

GFR 12 – A

[(SEE RULE 238 (1)]

FORM OF UTILIZATION CERTIFICATE FOR THE GRANTEE ORGANIZATION INCLUDING AUTONOMOUS ORGANIZATIONS

UTILIZATION CERTIFICATE FOR THE YEAR..2020-2021.....
(period ending 31st March 2021)
In respect of recurring/non-recurring
GRANT-IN-AID/SALARIES/CREATION OF CAPITAL ASSETS

1. Name of the scheme — Principles of formation of nanostructured oxide materials and nanosized catalysts on their basis for hydrogen power production applications (DST-RFBR)
2. Whether recurring or non-recurring grants — Recurring
3. Grants position at the beginning of the financial year
   - (i) Cash in Hand/Bank — 8,63,498/-
   - (ii) Unadjusted advances — NIL
   - (iii) Total — 8,63,498/-

4. Details of grants received, expenditure incurred and closing balances: (Actuals)

Unspent Balances of Grants received year [figure as at Sl No 3(iii)]	Interest earned thereon	Interest deposited back to the government	Grant received during the year			Total Available funds (1+2-3+4)	Expenditure incurred	Closing Balance (5-6)
1	2	3	4			5	6	7
			Sanction no. (i)	Date (ii)	Amount (iii)			
8,63,498/-	20,949/-	NIL	-	-	-	8,84,447/-	NIL	8,84,447/-

5. Component wise utilization of grants:

Grants-in-aid-General	Grant-in-aid -Salary	Grants-in-aid-creation of capital	Total
NIL	NIL	NIL	NIL

6. Details of grants position at end of the year
   - (i) Cash in Hand /Bank — 8,84,447/-
   - (ii) Unadjusted Advance — NIL
   - (iii) Total — 8,84,447/-

7. Certified that I have satisfied myself that the conditions on which grants were sanctioned have been duly fulfilled /are being fulfilled and that I have exercised following checks to see that the money has been actually utilized for the purpose for which it was sanctioned:

(i) The main accounts and other subsidiary accounts and registers (including assets register) are maintained as prescribed in the relevant Act/Rules/standing instructions (mention the Act/Rules)

and have been duly audited by designated auditors. The figures depicted above tally with the audited figures mentioned in financial statements/accounts.

(ii) There exist internal controls for safeguarding public funds/assets, watching outcomes and achievements of physical targets against the financial inputs, ensuring quality in asset creation etc. & the periodic evaluation of internal controls is exercised to ensure their effectiveness.

(iii) To the best of our knowledge and belief, no transactions have been entered that are in violation of relevant Act/Rules/standing instructions and scheme guidelines.

(iv) The responsibilities among the key functionaries for execution of the scheme have been assigned in clear terms and are not general in nature.

(v) The benefits were extended to the intended beneficiaries and only such areas/districts were covered where the scheme was intended to operate.

(vi) The expenditure on various components of the scheme was in the proportions authorized as per the scheme guidelines and terms and conditions of the grants-in-aid.

(vii) It has been ensured that the physical and financial performance under.....(name of the scheme has been according to the requiements, as prescribed in the guidelines issued by Govt. of India and the performance/targets achieved statement for the year to which the utilization of the fund resulted in outcomes give at Annexure- I duly enclosed.

(viii) The utilization of the fund resulted in outcomes given at Annexure – II duly enclosed (to be formulated by the Ministry /Department concerned as per their requirements/specifications.)

(ix) Details of various schemes executed by the agency through grants-in-aid received from the same Ministry or from other Ministries is enclosed at Annexure—II (to be formulated by the Ministry/Department concerned as per their requirements/specifications).

Date:

Place:

Signature 10/7/23

Name
Chief Finance Officer
(Head of the Finance)

Finance Officer
Tezpur University

Signature 10/7/23

Name
Head of the Organisation

Registrar
Tezpur University

(TO BE FILLED IN BY DST)

2. Certified that I have satisfied myself that the conditions on which the grants-in-aid was sanctioned have been fulfilled/are being fulfilled and that I have exercised the following checks to see that the money was actually utilised for the purpose for which it was sanctioned:

Kinds of checks exercised.

1.
2.
3.
4.
5.

Signature
Designation
Date

Annexure - II

REQUEST FOR ANNUAL INSTALLMENT WITH UP-TO-DATE STATEMENT OF EXPENDITURE

(Year Means Financial Year i.e.. 1 st April to 31 st March of Next Year)

1. Sanction Letter No. INT/RUS/RFBR/P-189
2. Total Project Cost Rs. 24,61,800/-
3. Sanctioned/Revised project cost (if applicable) Rs. None
4. Date of commencement of Project 02.09.2015
5. Statement of Expenditure

6. Grant Received in each year:
   a. I year Rs . 11,01,320/-
   b. II year Rs. 10,02,385/-
   c. III year Rs. NIL
   d. Interest, if any Rs. 6,904/- + 15/- +13/- +25,060/-+ 6,289/-+20949/-
   e. Total Rs. 21,62,935/-

Month **Year**

Month & Year	Expenditure incurred/ committed
April 2020-March 2021	NIL

Note:

1. Expenditure under the sanctioned heads, at any point of time, should not exceed funds allocated under the head, without prior approval of DST i.e. Figures in Column (vii) should not exceed corresponding figures in Column (iii)
2. Utilisation Certificate for each financial year ending 31st March has to be enclosed, along with request for carry-forward permission to next year

Annexure IInd Continued

Sl. No.	Sanctioned Heads**	Funds Allocated (*)	Expenditure Incurred					Balance as on date (Col. iii - vii)	Required Funds till 31 March	Remarks (if any)
			I Yr.	II Yr.*	III Yr.	IV-VI Yr.	Total (iv+v+vi)			
i.	ii.	iii.	iv.	v.	vi.		vii.	viii.	ix.	x.
1.	Salaries	3,30,000	87,733	1,68,000	70,467	No expense made during these period	3,26,200	3,800	-	
2.	Permanent Equipments	NIL	-	-	-		-	-	-	
3.	Supplies & Materials/consumables	1,00,000+ 95,355	99,758	89,665	-		1,89,423	5,932	-	
4.	Travel of Indian Scientists Abroad	4,71,200+ 7,06,800	3,62,669	-	-		3,62,669	8,15,331	-	
5.	Hospitality of Foreign Scientists - Per diem @ Rs._____ - Accommodation	NA	-	-	-		-	-	-	
6.	Contingencies	1,00,000+ 1,00,000	99,849	99,997	-		1,99,846	154	-	
7.	Overhead Expenses	1,00,120+ 1,00,230	1,00,120	-	1,00,230		2,00,350	0	-	
8.	Interest earned	59,230	-	-	-		-	59,230	-	
	Total	21,62,935	7,50,129	3,57,662*	1,70,697		12,78,488	8,84,447	-	

Note : * The 2nd year expenses were made utilizing the carry forward amount of 2015-2016 distributed to meet the expenses of Manpower, Consumable and Contingency as per rule. We did not receive 2nd instalment on time. Later on submission of PCR, it was intimated by DST that it was disbursed without any SO or intimation and asked to revise the UC/SE. However, it took long time to get SO. Immediately after that lockdown started and the process was delayed. The 2nd instalment was received only on 03/11/2017, i.e. after completion of project.

Name & Signature
Principal Investigator: Dr. Pankaj Bharali
Date: 26/04/2023

Signature of Competent financial authority
Date: 15/4/2023
Finance Officer
Tezpur University

GFR 12 – A

[(SEE RULE 238 (1)]

FORM OF UTILIZATION CERTIFICATE FOR THE GRANTEE ORGANIZATION INCLUDING AUTONOMOUS ORGANIZATIONS

UTILIZATION CERTIFICATE FOR THE YEAR..2021-2022.....
(period ending 31st March 2022)
In respect of recurring/non-recurring
GRANT-IN-AID/SALARIES/CREATION OF CAPITAL ASSETS

1. Name of the scheme — Principles of formation of nanostructured oxide materials and nanosized catalysts on their basis for hydrogen power production applications (DST-RFBR)
2. Whether recurring or non-recurring grants — Recurring
3. Grants position at the beginning of the financial year
   - (i) Cash in Hand/Bank — 8,84,447/-
   - (ii) Unadjusted advances — NIL
   - (iii) Total — 8,84,447/-

4. Details of grants received, expenditure incurred and closing balances: (Actuals)

Unspent Balances of Grants received year [figure as at Sl No 3(iii)]	Interest earned thereon	Interest deposited back to the government	Grant received during the year			Total Available funds (1+2-3+4)	Expenditure incurred	Closing Balance (5-6)
1	2	3	4			5	6	7
			Sanction no. (i)	Date (ii)	Amount (iii)			
8,84,447/-	21,473/-	NIL	-	-	-	9,05,920/-	NIL	9,05,920/-

5. Component wise utilization of grants:

Grants-in-aid-General	Grant-in-aid -Salary	Grants-in-aid-creation of capital	Total
NIL	NIL	NIL	NIL

6. Details of grants position at end of the year
   - (i) Cash in Hand /Bank — 9,05,920/-
   - (ii) Unadjusted Advance — NIL
   - (iii) Total — 9,05,920/-

7. Certified that I have satisfied myself that the conditions on which grants were sanctioned have been duly fulfilled /are being fulfilled and that I have exercised following checks to see that the money has been actually utilized for the purpose for which it was sanctioned:

(i) The main accounts and other subsidiary accounts and registers (including assets register) are maintained as prescribed in the relevant Act/Rules/standing instructions (mention the Act/Rules)

and have been duly audited by designated auditors. The figures depicted above tally with the audited figures mentioned in financial statements/accounts.

(ii) There exist internal controls for safeguarding public funds/assets, watching outcomes and achievements of physical targets against the financial inputs, ensuring quality in asset creation etc. & the periodic evaluation of internal controls is exercised to ensure their effectiveness.

(iii) To the best of our knowledge and belief, no transactions have been entered that are in violation of relevant Act/Rules/standing instructions and scheme guidelines.

(iv) The responsibilities among the key functionaries for execution of the scheme have been assigned in clear terms and are not general in nature.

(v) The benefits were extended to the intended beneficiaries and only such areas/districts were covered where the scheme was intended to operate.

(vi) The expenditure on various components of the scheme was in the proportions authorized as per the scheme guidelines and terms and conditions of the grants-in-aid.

(vii) It has been ensured that the physical and financial performance under.....(name of the scheme has been according to the requiements, as prescribed in the guidelines issued by Govt. of India and the performance/targets achieved statement for the year to which the utilization of the fund resulted in outcomes give at Annexure- I duly enclosed.

(viii) The utilization of the fund resulted in outcomes given at Annexure – II duly enclosed (to be formulated by the Ministry /Department concerned as per their requirements/specifications.)

(ix) Details of various schemes executed by the agency through grants-in-aid received from the same Ministry or from other Ministries is enclosed at Annexure—II (to be formulated by the Ministry/Department concerned as per their requirements/specifications).

Date:

Place:

Signature

Name
Chief Finance Officer
(Head of the Finance)

Finance Officer
Tezpur University

Signature

Name
Head of the Organisation

Registrar
Tezpur University

(TO BE FILLED IN BY DST)

2. Certified that I have satisfied myself that the conditions on which the grants-in-aid was sanctioned have been fulfilled/are being fulfilled and that I have exercised the following checks to see that the money was actually utilised for the purpose for which it was sanctioned:

Kinds of checks exercised.

1.
2.
3.
4.
5.

Signature
Designation
Date

Annexure - II

REQUEST FOR ANNUAL INSTALLMENT WITH UP-TO-DATE STATEMENT OF EXPENDITURE

(Year Means Financial Year i.e.. 1 st April to 31 st March of Next Year)

1. Sanction Letter No. INT/RUS/RFBR/P-189
2. Total Project Cost Rs. 24,61,800/-
3. Sanctioned/Revised project cost (if applicable) Rs. None
4. Date of commencement of Project 02.09.2015
5. Statement of Expenditure

6. Grant Received in each year:
   a. I year Rs . 11,01,320/-
   b. II year Rs. 10,02,385/-
   c. III year Rs. NIL
   d. Interest, if any Rs. 6,904/- + 15/- +13/- +25,060/-+ 6,289/-+20949/- +21473/-
   e. Total Rs. 21,84,408/-

Month **Year**

Month & Year	Expenditure incurred/ committed
April 2021-March 2022	NIL

Note:

1. Expenditure under the sanctioned heads, at any point of time, should not exceed funds allocated under the head, without prior approval of DST i.e. Figures in Column (vii) should not exceed corresponding figures in Column (iii)
2. Utilisation Certificate for each financial year ending 31st March has to be enclosed, along with request for carry-forward permission to next year

Annexure IInd Continued

Sl. No.	Sanctioned Heads**	Funds Allocated (*)	Expenditure Incurred					Balance as on date (Col. iii - vii)	Required Funds till 31 March	Remarks (if any)
			I Yr.	II Yr.*	III Yr.	IV-VII Yr.	Total (iv+v+vi)			
i.	ii.	iii.	iv.	v.	vi.		vii.	viii.	ix.	x.
1.	Salaries	3,30,000	87,733	1,68,000	70,467	No expense made during these period	3,26,200	3,800	-	
2.	Permanent Equipments	NIL	-	-	-		-	-	-	
3.	Supplies & Materials/consumables	1,00,000+ 95,355	99,758	89,665	-		1,89,423	5,932	-	
4.	Travel of Indian Scientists Abroad	4,71,200+ 7,06,800	3,62,669	-	-		3,62,669	8,15,331	-	
5.	Hospitality of Foreign Scientists - Per diem @ Rs._____ - Accommodation	NA	-	-	-		-	-	-	
6.	Contingencies	1,00,000+ 1,00,000	99,849	99,997	-		1,99,846	154	-	
7.	Overhead Expenses	1,00,120+ 1,00,230	1,00,120	-	1,00,230		2,00,350	0	-	
8.	Interest earned	80,703	-	-	-		-	80,703	-	
	Total	21,84,408	7,50,129	3,57,662*	1,70,697		12,78,488	9,05,920	-	

Note : * The 2nd year expenses were made utilizing the carry forward amount of 2015-2016 distributed to meet the expenses of Manpower, Consumable and Contingency as per rule. We did not receive 2nd instalment on time. Later on submission of PCR, it was intimated by DST that it was disbursed without any SO or intimation and asked to revise the UC/SE. However, it took long time to get SO. Immediately after that lockdown started and the process was delayed. The 2nd instalment was received only on 03/11/2017, i.e. after completion of project.

Name & Signature
Principal Investigator: Dr. Pankaj Bharali
Date: 26/04/2023

Signature of Competent financial authority
Date:

Finance Officer
Tezpur University

GFR 12 – A

[(SEE RULE 238 (1)]

FORM OF UTILIZATION CERTIFICATE FOR THE GRANTEE ORGANIZATION INCLUDING AUTONOMOUS ORGANIZATIONS

UTILIZATION CERTIFICATE FOR THE YEAR..2022-2023.....
(period ending 31st March 2023)
In respect of recurring/non-recurring
GRANT-IN-AID/SALARIES/CREATION OF CAPITAL ASSETS

1. Name of the scheme — Principles of formation of nanostructured oxide materials and nanosized catalysts on their basis for hydrogen power production applications (DST-RFBR)
2. Whether recurring or non-recurring grants — Recurring
3. Grants position at the beginning of the financial year
   - (i) Cash in Hand/Bank — 9,05,920/-
   - (ii) Unadjusted advances — NIL
   - (iii) Total — 9,05,920/-

4. Details of grants received, expenditure incurred and closing balances: (Actuals)

Unspent Balances of Grants received year [figure as at Sl No 3(iii)]	Interest earned thereon	Interest deposited back to the government	Grant received during the year			Total Available funds (1+2-3+4)	Expenditure incurred	Closing Balance (5-6)
1	2	3	4			5	6	7
			Sanction no. (i)	Date (ii)	Amount (iii)			
9,05,920/-	19352/-	NIL	-	-	-	9,25,272/-	NIL	9,25,272/-

5. Component wise utilization of grants:

Grants-in-aid-General	Grant-in-aid -Salary	Grants-in-aid-creation of capital	Total
NIL	NIL	NIL	NIL

6. Details of grants position at end of the year
   - (i) Cash in Hand /Bank — 9,25,272/-
   - (ii) Unadjusted Advance — NIL
   - (iii) Total — 9,25,272/-

7. Certified that I have satisfied myself that the conditions on which grants were sanctioned have been duly fulfilled /are being fulfilled and that I have exercised following checks to see that the money has been actually utilized for the purpose for which it was sanctioned:

(i) The main accounts and other subsidiary accounts and registers (including assets register) are maintained as prescribed in the relevant Act/Rules/standing instructions (mention the Act/Rules)

and have been duly audited by designated auditors. The figures depicted above tally with the audited figures mentioned in financial statements/accounts.

(ii) There exist internal controls for safeguarding public funds/assets, watching outcomes and achievements of physical targets against the financial inputs, ensuring quality in asset creation etc. & the periodic evaluation of internal controls is exercised to ensure their effectiveness.

(iii) To the best of our knowledge and belief, no transactions have been entered that are in violation of relevant Act/Rules/standing instructions and scheme guidelines.

(iv) The responsibilities among the key functionaries for execution of the scheme have been assigned in clear terms and are not general in nature.

(v) The benefits were extended to the intended beneficiaries and only such areas/districts were covered where the scheme was intended to operate.

(vi) The expenditure on various components of the scheme was in the proportions authorized as per the scheme guidelines and terms and conditions of the grants-in-aid.

(vii) It has been ensured that the physical and financial performance under.....(name of the scheme has been according to the requiements, as prescribed in the guidelines issued by Govt. of India and the performance/targets achieved statement for the year to which the utilization of the fund resulted in outcomes give at Annexure- I duly enclosed.

(viii) The utilization of the fund resulted in outcomes given at Annexure – II duly enclosed (to be formulated by the Ministry /Department concerned as per their requirements/specifications.)

(ix) Details of various schemes executed by the agency through grants-in-aid received from the same Ministry or from other Ministries is enclosed at Annexure—II (to be formulated by the Ministry/Department concerned as per their requirements/specifications).

Date:

Place:

Signature

Name
Chief Finance Officer
(Head of the Finance)

Finance Officer
Tezpur University

Signature

Name
Head of the Organisation

Registrar
Tezpur University

(TO BE FILLED IN BY DST)

2. Certified that I have satisfied myself that the conditions on which the grants-in-aid was sanctioned have been fulfilled/are being fulfilled and that I have exercised the following checks to see that the money was actually utilised for the purpose for which it was sanctioned:

Kinds of checks exercised.

1.
2.
3.
4.
5.

Signature
Designation
Date

Annexure - II

REQUEST FOR ANNUAL INSTALLMENT WITH UP-TO-DATE STATEMENT OF EXPENDITURE

(Year Means Financial Year i.e.. 1 st April to 31 st March of Next Year)

1. Sanction Letter No. INT/RUS/RFBR/P-189
2. Total Project Cost Rs. 24,61,800/-
3. Sanctioned/Revised project cost (if applicable) Rs. None
4. Date of commencement of Project 02.09.2015
5. Statement of Expenditure

6. Grant Received in each year:
   a. I year Rs . 11,01,320/-
   b. II year Rs. 10,02,385/-
   c. III year Rs. NIL
   d. Interest, if any Rs. 6,904/- + 15/- +13/- +25,060/-+ 6,289/-+20,949/- +21,473/-+19,352/-
   e. Total Rs. 22,03,760/-

Month **Year**

Month & Year	Expenditure incurred/ committed
April 2022-March 2023	NIL

Note:

1. Expenditure under the sanctioned heads, at any point of time, should not exceed funds allocated under the head, without prior approval of DST i.e. Figures in Column (vii) should not exceed corresponding figures in Column (iii)
2. Utilisation Certificate for each financial year ending 31st March has to be enclosed, along with request for carry-forward permission to next year

Annexure IInd Continued

Sl. No.	Sanctioned Heads**	Funds Allocated (*)	Expenditure Incurred					Balance as on date (Col. iii - vii)	Required Funds till 31 March	Remarks (if any)
			I Yr.	II Yr.*	III Yr.	IV-VIII Yr.	Total (iv+v+vi)			
i.	ii.	iii.	iv.	v.	vi.		vii.	viii.	ix.	x.
1.	Salaries	3,30,000	87,733	1,68,000	70,467	No expense made during these period	3,26,200	3,800	-	
2.	Permanent Equipments	NIL	-	-	-		-	-	-	
3.	Supplies & Materials/consumables	1,00,000+ 95,355	99,758	89,665	-		1,89,423	5,932	-	
4.	Travel of Indian Scientists Abroad	4,71,200+ 7,06,800	3,62,669	-	-		3,62,669	8,15,331	-	
5.	Hospitality of Foreign Scientists - Per diem @ Rs._____ - Accommodation	NA	-	-	-		-	-	-	
6.	Contingencies	1,00,000+ 1,00,000	99,849	99,997	-		1,99,846	154	-	
7.	Overhead Expenses	1,00,120+ 1,00,230	1,00,120	-	1,00,230		2,00,350	0	-	
8.	Interest earned	1,00,055	-	-	-		-	1,00,055	-	
	Total	22,03,760	7,50,129	3,57,662*	1,70,697		12,78,488	9,25,272	-	

Note : * The 2nd year expenses were made utilizing the carry forward amount of 2015-2016 distributed to meet the expenses of Manpower, Consumable and Contingency as per rule. We did not receive 2nd instalment on time. Later on submission of PCR, it was intimated by DST that it was disbursed without any SO or intimation and asked to revise the UC/SE. However, it took long time to get SO. Immediately after that lockdown started and the process was delayed. The 2nd instalment was received only on 03/11/2017, i.e. after completion of project.

Name & Signature
Principal Investigator: Dr. Pankaj Bhanti.
Date: 26/04/2023

Signature of Competent financial authority
Date: 10/7/2023
Finance Officer
Jiwaji University

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