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Department of Chemical Sciences

A REPORT ON

**DST-Indo-Russia Collaborative project**

1. Name of the Collaborative Activity: DST Indo-Russia Collaborative research Project
2. Nature of Activity: R&D
3. Name of the Collaborating Agency/ Individual with affiliation, and contact details: Boreskov Institute of Catalysis, Novosibirsk, Russia
4. Summary of collaboration: Transition metal oxide based electrocatalysts (ECs) with mixed valence state have gained considerable attention in recent times. Herein, Co3O4–CuO/Cu2O/C nanostructure with mixed valence oxides is reported as an efficient bi-functional EC towards oxygen electrode reactions in alkaline medium. The EC displays higher current density of 6.2 mA cm 2 and mass activity of 12.9 mA mg 1 compared to that of commercially available Pt/C in 0.1 M KOH solution for oxygen reduction reaction (ORR). Rotating disk electrode measurements are used to understand the kinetics of the reaction and the EC is durable up to 1000 redox cycles. The material is highly stable up to 7000 s by retaining 99% of its initial current. The fast electron transfer is established by the smaller Tafel slope value of 83.6 mV dec 1. In addition, the prepared material is also active for oxygen evolution reaction (OER) in 0.1 M KOH solution. Thus, the nanostructure with different bimetallic active sites is found to be a potential material for oxygen electrocatalysis.
5. List of year-wise activities under the collaboration:

   *Activity 2019-20:*
   Development of Pd-based trimetallic electrocatalysts for oxygen electrode reactions
   *Activity 2020-21*
   Development of redox active metal oxides for oxygen reduction reaction in alkaline electrolyte

| **Signature and Seal of Head of Department/ Centre/ Cell** |
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| R. Bora 9.02.2022 Prof. & Head Department of Chemical Sciences TEZPUR UNIVERSITY<br>**Name: Professor Ruli Bora**<br>**Designation: Professor & Head** |