National Institute of Technology Rourkela

Progress Seminar

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| Seminar Title | : Design of Novel Nanostructured Spinel Manganates Supported on Bimetallic Layered Double Hydroxide for Electrochemical Energy Conversion and Storage Applications. |
| Speaker | : Bhismadev Mahananda ( Rollno : 522cy1014) |
| Supervisor | : Priyabrat Dash |
| Venue | : Chemistry Department Seminar Room |
| Date and Time | : 25 Sep 2025 (4.15 PM) |
| Abstract | : Electrochemical methods are considered as the most effective and sustainable approach for energy conversion (oxygen evolution reaction (OER), hydrogen evolution reaction (HER), oxygen reduction reaction (ORR)) and storage (battery, supercapacitor) applications. Nanostructured spinel manganates ($AMn_2O_4$, where A can be Co, Ni, Cu, Mn, Zn, or Fe) have gained attention as electrode materials due to their cost-effectiveness, abundance, and excellent electrochemical properties. Although spinel shows properties like earth abundance, cost effectiveness and excellent electrochemical properties, still its performance remains inadequate due to issues with low ionic conductivity and partial dissolution in alkaline electrolytes, which lead to poor stability. Numerous approaches have been suggested to enhance the electrocatalytic performance. Among various support materials LDH and their derivatives (metal oxyhydroxide, hydroxides, phosphides, bimetal nitrides, selenides) had been widely investigated as electrocatalyst for electrochemical energy conversion and storage applications owing to their properties like low-cost earth abundantly, tuneable properties, enhance catalytic active sites and excellent electrochemical stability and durability. However, to the best of our knowledge bimetallic LDHs supported on manganates-based spinel have not been reported yet. Keeping all these in mind, the whole PhD research work is divided into two major objectives. The first part of my research objectives is to investigate the applications of bimetallic LDH supported spinel nanocomposite for the energy conversion applications, while the second objective mainly focuses on the energy storage application. The formation of the nanocomposites will be confirmed by characterization like XRD, FESEM, SEM, TEM, XPS and its electrocatalytic energy conversion and storage applications will be evaluated via CV, LSV, EIS, chronopotentiometry, chronoamperometry and galvanostatic charge discharge curve. The detailed structural analysis as well as the electrochemical analysis will be done in the future. |