## Seminar

## Institute for Plasma Research

Title:	Development of Electrocatalyst and its
	Implementation in Water Splitting Process
Speaker:	Dr. Amit Kumar Rana
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Date:	02 <sup>nd</sup> December 2023 (Saturday)
Time:	03:30 PM
Venue:	Online mode
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## Abstract

Creating highly efficient electrocatalysts for water splitting reactions is crucial for energy conversion purposes. This study focuses on the development of high-performance nonprecious electrocatalysts for the critical process of water splitting, essential for various energy conversion applications. Specifically, we have created multi-dimensional carbonencapsulated perovskite oxide materials using lanthanum cobalt oxide (LaCoO<sub>3</sub>) as the base, which exhibit remarkable efficiency as electrocatalysts for the oxygen evolution reaction (OER). We have undertaken a systematic exploration of the impact of different carbon compounds, including acetylene black (AB), multi-walled carbon nanotubes (MWCNT), and reduced graphene oxide (rGO), on the interface modification within LaCoO<sub>3</sub>. Our investigation begins with the in-situ incorporation of these multi-dimensional carbon materials (AB, MWCNT, and rGO) into LaCoO<sub>3</sub>. This process results in well-defined structural and morphological features for LaCoO<sub>3</sub> and its nanocomposites, offering enhanced surface active sites for catalytic activity. Thanks to this interface engineering, the LaCoO<sub>3</sub>/rGO nanocomposite demonstrates remarkable performance improvements over pristine LaCoO<sub>3</sub>, LaCoO<sub>3</sub>/AB, and LaCoO<sub>3</sub>/MWCNT counterparts. The LaCoO<sub>3</sub>/rGO nanocomposite stands out for its remarkable performance, boasting a low onset potential of 1.58 V when operating at 10 mAcm<sup>-2</sup>. Moreover, it exhibits a minimal Tafel slope of 85 mV dec<sup>-1</sup>. This enhanced OER performance is attributed to the integration of rGO sheets onto LaCoO<sub>3</sub> particles, which creates a conductive pathway and introduces electrochemically active sites crucial for catalysis, facilitating efficient charge and mass transport. Furthermore, the LaCoO<sub>3</sub>/rGO nanocomposite exhibits exceptional long-term stability over 20 hours. Therefore, this work represents a significant advancement in the development of nonprecious electrocatalysts with applications in clean energy technologies, showcasing the potential for future progress in this vital field.