Seminar

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Institute for Plasma Research

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Title: Graphene oxide nanocomposites for hydrogen storage application

Speaker: Dr. Ashutosh Dubey

Central University Gujarat, Gandhinagar

Date: 18th July 2023 (Tuesday)

Time: 11:00 AM

Venue: Online

Meeting link: http://meet.google.com/gzw-yzai-agh

Abstract

The continuous growing world population has leads to the energy scarcity in the world. Hence, it is imperative for researchers to develop sustainable, clean, cost-effective eco-friendly materials and fuels to address the growing energy demand. Hydrogen fuel is potential solution to the growing energy demand. But, safe, dense, solid-state hydrogen storage and transport remains a major challenge. Here we have proposed noble nanomaterial graphene oxide-based nanocomposites (GO/Fe_3O_4, GO-Ni $(OH)_2$) etc.) for safe solid-state hydrogen storage application. The graphene oxide-based nanocomposites will be synthesized by microwave-assisted modified Hummers (MA-MH) method. The (MA-MH) method is cost-effective, rapid, eco-friendly and is suitable for synthesis of carbon nanomaterial and nanocomposites. The synthesized nanocomposites will be Characterized by XRD, FESEM, HRTEM, Raman, BET, ICPOES techniques. Later H_2 adsorption capacity of nanocomposites will be determined by adsorption-desorption isotherms. The developed nanocomposites are stable and offers safe storage of hydrogen fuel for automotive applications, against noncryogenic reversible material. Moreover, the 2D graphene layers protects nanocrystals from ambient conditions, while also imparting new functionality. Additionally, he developed stable metal nanocomposite is promising for batteries, catalysis applications. In the composite, GO will be reduced to rGo. The reduced (rGO) sheets will acts as a semipermeable membrane which allows only diffusion of hydrogen along the layers while blocking O_2 and H_2O. Hence providing maximum environmental stability, selective hydrogen permeability and kinetic enhancement in hydrogen storage. We believe that our research work is promising for practical solid-state hydrogen storage in the coming future.