Seminar

Institute for Plasma Research

Title : Magnetic nanostructures for anisotropic and supercapacitive studies

Speaker: Dr. Umesh Kumar Gaur
PSED Division, FCIPT, IPR Gandhinagar

Date : 2nd February 2021 (Tuesday)

Time : 11.00 AM

Venue : Online - Join the talk: https://meet.ipr.res.in/MukeshRanjan

Abstract :

In the present study, work on two different problems has been done for magnetic anisotropic[1] and supercapacitive studies[2]. For magnetic anisotropic studies, Co/Ag nanostructures have been grown on patterned Si substrate at room temperature. Magnetron sputtering and electron beam evaporation method has been used for the growth of Co and Ag nanostructures, respectively. From FESEM, it has been observed that up to an optimized thickness Co growth follow the ripple pattern and after that a continuous film was observed. In case of Co/Ag growth, Ag helps Co to attain the spherical shape and chains of spherical Co/Ag nanoparticles along the ripple direction had been observed. The as grown nanostructures show the non-saturated M-H curves, when characterized with Magneto-optic Kerr effect (MOKE). The further magneto anisotropic studies of these nanostructures are under progress. For supercapacitive studies, hematite (α-Fe_2O_3) nanorods has been synthesized by cost effective hydrothermal method and further treated with Ar ion plasma fireball. From XRD studies, no noticeable change was observed in pristine and plasma treated hematite nanostructures. The FESEM images reveal that the morphology has been changed from nano rods to sheet like after plasma treatment. The XPS and optical studies confirm the formation of point defects/oxygen vacancies in plasma treated hematite nanostructures. Magnetic measurements have been performed by SQUID magnetometer and exhibit enhanced magnetization in plasma treated hematite nanostructures, possibly due the change in morphology and formation of point defects/oxygen vacancies. Electrode preparation and supercapacitive studies are under progress.

References:
1. M. D. Mansour et al Phys. Rev. B 102, 155403 (2020)
2. V. Sharma et al Adv. Energy Mater. 8, 1800573 (2018)