

Seminar

Institute for Plasma Research

Title : Growth of Co and Co/Ag ordered nanostructures on ion beam irradiated patterned Si substrate for magnetic anisotropy studies

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Date : 23rd November 2019 (Saturday)

Time : 03.00 PM

Venue : Seminar Hall, IPR

Abstract:

Nanotechnology, the framework of the next industrial revolution has shown tremendous applications in the field of magnetism. The distinctive characteristics of magnetic nanostructures such as exchange bias effect, large uniaxial magnetic anisotropy (UMA) as compared to bulk materials have opened avenues for the evolution of novel devices like magnetic supercapacitors, ultrahigh density data storage devices and recording media.¹ Currently, commercially available magnetic disks utilize a continuous magnetic film and a longitudinal or perpendicular bit format in which one bit is stored in hundreds of grains. Smaller grain size is required to increase the areal storage density of the disks, but below a certain size these grains cannot store data since the integrity of the data is affected by thermal fluctuations.² Patterned magnetic media which consists of arrays of individual nanomagnets is seen as a potential solution for ultrahigh density magnetic data storage.³ In the present study, ion beam irradiation technique was used to produce patterns on Si (100) substrate. It has been observed that by changing ion beam energy, the pattern morphology can be tuned. Further, Co and Co/Ag nanostructures have been grown on pattern 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. XRD results show that as grown Co nanostructures are amorphous in nature and did not show any saturation magnetization when characterized with Magneto-optic Kerr effect (MOKE). At the annealing in vacuum at 300°C and 500°C well crystalline nanostructures has been observed however morphology was not sustained at 500°C. So Co and Co/Ag samples annealed at 300°C shows well ordered crystalline nanostructures. The magneto anisotropic studies of these nanostructures are under progress.

References:

1. S. Mondal, A. Talapatra, J. Arout Chelvane, J. Mohanty, and A. Barman, Phys. Rev. B, 100, 054436 (2019)
 2. M. M. Vopson, E. Zemaityte, M. Spreitzer and E. Namvar, J. Appl. Phys. 116, 113910 (2014)
 3. A. Lara, J. Robledo Moreno, K. Y. Guslienko and F. G. Aliev, Scientific reports, 7, 5597 (2017)
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