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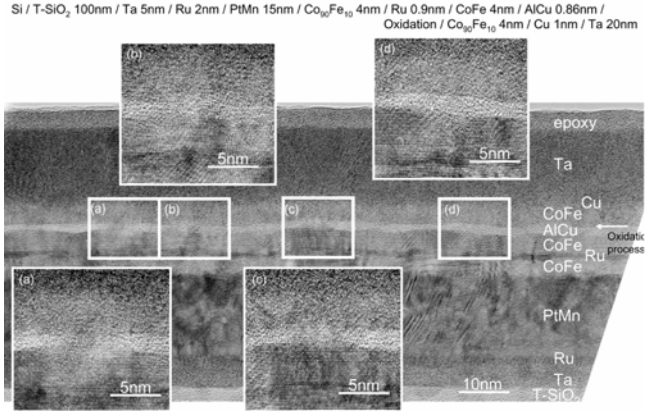
Presentation Title:

Nanostructured magnetic materials for data storage applications

Abstract:

Modern magnetic materials for data storage receive considerable size constraints for achieving higher performance and higher density of magnetic recording. Complicated nanosized structure must be fabricated either naturally or artificially since the magnetic properties and spin dependent electron transport are extremely sensitive to structures. In this talk, we will show several examples of nanostructures used in modern magnetic materials and magnetic devices for data storage applications and discuss how the nanostructures influence magnetic properties. One intriguing example is the multi-layer structure of a current-confined-path current-perpendicular-to-plane (CCP-CPP) magnetoresistive device. In earlier magnetoresistive devices, only the planer interfaces in the multi-layer structure had to be considered. However, in the CCP-CPP MR device, the current is confined in the metal nanobridges that are formed in insulator layers. Such high density nanobridges are formed by self-organization during the oxidation process, and the areal density and the diameters of these nanobridges are thought to influence the value of magnetoresistance. In tunneling magnetoresistance devices, the interplay of interfacial structure and electron spin polarization of ferromagnetic electrode is important, but not much work has been done to measure spin polarization and to characterize interfacial structure independently. Our recent work on the characterization and magnetoresistive measurements have demonstrated that it is of critical importance to characterize the device nanostructures with an atomic scale resolution for discussing the performance of spintronics materials. In this lecture, we will be showing ample examples of the correlations between nanostructures and magnetic and electron transport phenomena that are of industrial importance.



References :

1. S. V. Karthink, A. Rajanikanth, Y. K. Takahashi, T. Ohkubo, and K. Hono, Spin polarization of quaternary $Co_2Cr_{1-x}Fe_xAl$ Heusler alloys, Appl. Phys. Lett., (2006), in press.
2. H. Fukuzawa, H. Yuasa, K. Koi, H. Iwasaki, Y. Tanaka, Y. K. Takahashi, and K. Hono, Nano-constricted structure for current-confined-path in CPP spin-valves with high MR, J. Appl. Phys. 97, 10C509 (2005).