Anisotropy Graded Media: Extending the Superparamagnetic Limit (abstract)

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Anisotropy Graded Media: Extending the Superparamagnetic Limit (abstract)

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The maximum storage density in magnetic media is limited by the superparamagnetic size of the grains that make up the bits. The superparamagnetic size can be reduced by increasing the anisotropy of the grains; however, in conventional media, in which the anisotropy of the grains is uniform, this leads to a proportionate increase in the switching field. In this project we propose to test this concept by fabricating and characterizing anisotropy graded films. We will use the hcp CoPtX system, with X = Cr or Ru, where the anisotropy gradient is obtained by grading the composition. Both sheet films and granular films will be fabricated. The anisotropy gradients will be determined by analyzing magnetization curves. Dynamic coercivity measurements will be used to determine the short-time coercivity and the zero-field energy barrier in the granular films. These results will be compared with similar measurements on films with uniform anisotropy films in order to test the predictions for graded media.

An Attempt to Enjoy Science Class Together with Parents and Children
— Let’s Make the Pile-of-Plates Polarizer (abstract)

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We plan to make a polarizer, which is called the “pile-of-plates polarizer,” by piling seven microscope slides with the Brewster’s angle of about 56 degrees inside a small camera obscura about the size of a deck of playing cards. By inserting transparent cellophane tape between the polarizer and the polarizing sheet and rotating it on the tilt, wonderful color patterns can be created. Using this method, you can create various kinds of image patterns such as Red-ogre, Blue-ogre and so on, according to the number and the shapes of the cellophane tapes. Moreover, if you look at the image patterns through a mirror, amazingly you can see the different-colored Red-ogre or the Blue-ogre on it. By considering the mystery of the light polarization and the history of its investigations, I hope to teach the students about the way many scientists have been brought up through studying and enjoying light polarization science. Also, I want to teach students that light polarization experiments are not limited to the pile-of-plates polarizer, but that there are many others.