

## Spin Torque and Nanorings

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Magnetic nanostructures, in which spin transport, interplay of materials, and small entities are important, have been at the forefront of nanomaterials and nanotechnology. A number of new phenomena have been discovered in magnetic nanostructures and some have led to important devices. In this presentation, some new aspects of spin torque and arrays of magnetic nanorings will be described. The spin torque effect offers the prospects of switching magnetic entities in multilayers and in single layers by a spin-polarized current. Nanoring magnets have the attributes of several unique magnetic configurations including the vortex state with two chiralities and the onion state. We have developed a new method for fabricating a large number ( $10^9$ ) of small nanorings (100 nm in diameter) over a macroscopic area (5 cm x 5 cm) with a high areal density (45 rings/ $\mu\text{m}^2$ ). The switching characteristics of Co nanorings, both symmetrical and asymmetrical will be described.