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Understanding the Cytoxicity of Permalloy Microdisks ALEKSANDRA KARAPETROVA, Pomona College, ELENA ROZHKOVA, Center for Nanoscale Materials, Argonne National Laboratory, VALENTIN NOVOSAD, PHILIP GACH, Materials Science Division, Argonne National Laboratory — Nanomagnetic materials offer exciting opportunities when attempting remote control of biological processes. For example, ferromagnetic microdisks are able to induce apoptosis via magnetomechanical stimulus. The rotation of the disks occurs under an alternating magnetic field. A spin vortex state is formed in the microdisk that gives them the ability to not congregate in the absence of magnetic field but to be mechanically responsive in the presence of field. Iron-nickel Permalloy disks are fabricated using optical lithography and metal deposition. The disks can be made with a layer of gold on the top and bottom sides for the purpose of surface functionalization such that fluorescent dyes and biological compounds can be bound. Since the magnetic core of the disks consists of a transition metal alloy, there is a possibility of reactive oxidative species (ROS) forming in aqueous solution by a Fenton reaction. The chemical stability of disks not coated with a gold layer were studied. ROS formation was detected using fluorescent probe hydroxyphenyl fluorescein, X-ray fluorescence microscopy, and Inductively Coupled Plasma-Mass Spectrometry (ICP-MS). No significant levels of hydroxyl radicals were detected at neutral pH. However, X-Ray fluorescence and ICP-MS did detect leaching.

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