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**Lithographically defined microdisks as alternative magnetic carriers for biomedical applications**[1] V. NOVOSAD, F.Y. FRADIN, K. BUCHANAN, K. YU. GUSLIENKO, V. YEFREMENKO, S.D. BADER, Materials Science Division, Argonne National Laboratory, A.J. ROSENGART, S.G. GUY, Departments of Neurology and Surgery, The University of Chicago — Magnetic particles can be used as a transduction mechanism for target-directed delivery, manipulation, detection and functional control of attached single bio-molecules or cells. Here we will demonstrate how thin film growth techniques combined with traditional mask-transfer lithography can offer a new concept of magnetic nanoparticles with superior properties for bio-medical applications. The experimental and micromagnetic data for small (from hundred nanometers to few microns) microdisks will be reported. The microdisks have zero remanence due to formation of magnetic vortices in each particle, which results in independent behavior of the assembly of disks, e.g. no agglomeration. A very high Ms (up to 20 kOe) can be achieved by applying relatively small magnetic fields. Furthermore, the static and dynamic properties of the microdisks can be tailored by choosing the appropriate geometrical aspect-ratio. We will also demonstrate that the resonant collective behavior of spins offers additional possibilities for detection by measurement of the reflected complex impedance of a coplanar micro-waveguide.

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