Planar magnetic particles for magneto-transduction studies in cell biology

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Nanotechnology has allowed the development of novel approaches to fight against medical diseases. Among them, superparamagnetic particles have demonstrated great potential in cell isolation, enhanced magnetic resonance imaging, and localized treatments by magnetic hyperthermia. Recently, new kind of particles with unique magnetic configurations such as vortex state or synthetic antiferromagnets has emerged in biotechnological applications as effective transductors. This contribution presents effective fabrication routes of submicrometric disks with either vortex or antiferromagnetic spin configurations. Interference lithography and electron beam evaporation were used for the fabrication of the nanomagnets. Their low remanence made them suitable for biomedical applications with the enhanced property of a large magnetic moment. Nanodisks biocompatibility was tested in-vitro assays with macrophages and skin cancer cell. No cytotoxicity effects were observed for periods of twenty-four hours. Optical confocal microscopy and scanning electron microscopy reveal a cellular uptake of nanodisks for short incubation times, even though for larger disks of up to a few micrometers in diameter. This result paves the way to investigate magneto-transduction effects in cell biology studies.

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Biography

Rafael Morales has a large experience on magnetic properties of thin films, multilayers and nanostructures. He has investigated magnetically coupled systems with ferromagnetic, ferrimagnetic and antiferromagnetic materials. He is interested in both their fundamental phenomena in Physics and novel applications in Biology.