Au-coated $Ni_{80}Fe_{20}$ nanodisks for biomedical applications.

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A nanofabrication technique based on self-assembling of polystyrene nanospheres is used to obtain magnetic $Ni_{80}Fe_{20}$ nanoparticles with a disk shape. The free-standing nanodisks (NDs) have diameter and thickness of about 630 nm and 30 nm respectively. The versatility of fabrication technique allows to cover the NDs surface with a protective Au layer with a thickness of about 5 nm [1]. Magnetization reversal has been studied by room-temperature hysteresis loop measurements in water-dispersed free-standing nanodisks. The reversal shows zero remanence, high susceptibility and nucleation/annihilation fields due to spin vortex formation.

In order to investigate their potential use in biomedical applications [2], nanodisks coated with or without the protective gold layer have been submitted to cultures of different cell lines, to evaluate cytotoxicity, uptake, and positioning of the NDs in the cellular environment. Figure 1 shows an overview of the nanodisks morphological and magnetic properties, and of their interaction with cellular environments.

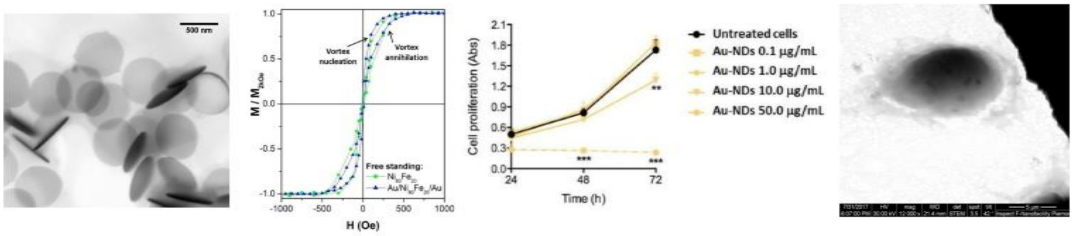

Figure 1. Left to right: STEM image of free-standing nanodisks. Hysteresis loops of free-standing nanodisks. Cell proliferation for different nanodisks concentrations. STEM image of nanodisks in cellular environment.

[1] G. Barrera, L. Serpe, F. Celegato, M. Coïsson, K. Martina, R. Canaparo, P. Tiberto, Interface Focus **6** (2016) 20160052.

[2] T.K.T. Nguyen, *Magnetic nanoparticles from fabrication to clinical application*, Boca Raton, FL, USA: CRC Press Taylor and Francis Group (2012).