Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad - 500107

Colloquium

Biomedical applications of spintronic nanomaterials

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Magnetic materials are currently used in a number of biomedical applications such as therapy, diagnostics, separation and sorting, with hyperthermia therapy being the most well-known. To date most biomedical magnetism uses very simple magnetic materials – typically superparamagnetic iron oxide nanoparticles (SPION). This talk will describe a new approach in which physical vapour deposition (sputtering) combined with lithography is used to form large numbers of nano- and micro-structures across a silicon wafer, which are then released into solution to form a highly functional magnetic liquid [1]. The advantage of this approach over SPION is that phenomena such as RKKY coupling, spin textures and interfacial anisotropy can all be used to make the magnetic properties of the liquid more advanced and therefore better suited to particular biomedical applications. In this talk we show how these advanced properties can be used to control the agglomeration of magnetic particles in liquid (a key problem in biomedical applications of magnetism) [2], can be used to treat glioblastoma brain tumours in mice with increased survival times of the animals [3] and can be combined with neural stem cells for targeted delivery [4].

References:

[1] T.Vemulkar, R.Mansell, R.P.Cowburn et al. Applied Physics Letters 107,012403 (2015)
[2] T.Vemulkar, E.N.Welbourne, R.P.Cowburn et al. Applied Physics Letters 110, 042402 (2017)
[3] Yu Cheng, M. E. Muroski, R.P.Cowburn et al. Journal of Controlled Release 223, 75 (2016)
[4] M. E. Muroski, R. A. Morshed, R.P.Cowburn et al. Plos One 11, e0145129 (2016)

Thursday, Dec 13th 2018

2:00 PM (Tea/Coffee at 1:30 PM)

Auditorium, TIFR-H