

# Nanomedical Imaging Agents

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## Description of the scientific aims

The central material platform under development is mesoporous silica and its composites, frequently combined with further organic functionalization to arrive at a multifunctional hybrid nanomaterial. Here, the research activities encompass both the development and utilization of these hybrid nanostructures as carriers for a broad chemical spectrum of therapeutic agents (small-molecular hydrophilic/hydrophobic drugs, biomolecules) and/or imaging agents (optical/magnetic/photoacoustic activity, radiolabels) or other active molecules (e.g. sensor dyes). The evaluation and application of the developed nanomedical agents for *in vitro* and *in vivo* drug delivery and biomedical imaging is carried out in close collaboration with our cross-disciplinary collaborators.

## Selected publications 2010-

1. J.M. Rosenholm, T. Gulin-Sarfraz, V. Mamaeva, R. Niemi, E. Özliseli, D. Desai, D. Antfolk, E. von Haartman, D. Lindberg, N. Prabhakar, T. Näreoja, C. Sahlgren, Prolonged dye release from mesoporous silica-based imaging probes facilitates long-term optical tracking of cell populations *in vivo*. *Small*, DOI: 10.1002/sml.201503392.
2. L.P. Neukirch, E. von Haartman, J.M. Rosenholm, A.N. Vamivakas, Multi-dimensional single-spin nano-optomechanics with a levitated nanodiamond. *Nature Photonics* 9, 2015, 653–657. (Cover of issue: OCTOBER 2015 VOL 9 NO 10 [www.nature.com/naturephotonics](http://www.nature.com/naturephotonics))
3. N Prabhakar, T Näreoja, E von Haartman, D Şen Karaman, SA Burikov, TA Dolenko, T Deguchi, V Mamaeva, PE Hänninen, II Vlasov, OA Shenderova, JM Rosenholm, Functionalization of graphene oxide nanostructures improves photoluminescence and facilitates their use as optical probes in preclinical imaging. *Nanoscale*, 2015, 7, 10410-10420.
4. J. Zhang, N. Prabhakar, T. Näreoja, J.M. Rosenholm, Semiconducting polymer encapsulated mesoporous silica particles with conjugated Europium complexes: towards enhanced luminescence under aqueous conditions. *ACS Applied Materials & Interfaces*, 6 (21), 2014, 19064–19074.
5. T. Gulin-Sarfraz, J. Zhang, D. Desai, J. Teuho, J. Sarfraz, H. Jiang, C. Zhang, C. Sahlgren, M. Lindén, H. Gu, J.M. Rosenholm, Combination of magnetic field and surface functionalization for reaching synergistic effects in cellular labeling by magnetic core-shell nanospheres. *Biomaterials Science* 2, 2014, 1750-1760.