Magnetic Nanoparticles in Biomedical Applications

Tapas Sen, BSc (Hons), MSc, PhD, FRSC, FHEA

Reader in Nanomaterials Chemistry
School of Natural Sciences
Faculty of Science & Technology
https://www.uclan.ac.uk/staff_profiles/dr_tapas_sen.php
University of Central Lancashire, Preston, PR1 2HE, United Kingdom
&
Lead, Nano-biomaterials Research Group (www.senlabs.org)

Tel: +44(0)1772894371; Fax: +44(0)1772894981; Email: tsen@uclan.ac.uk; skype: tapas.sen4

ABSTRACT

Magnetic nanomaterials and their application via surface patterning with bio-chemicals has a direct impact in bio-sensing and bio-separation. Surface patterning of nanoparticles in suspension can be a complex process due to the aggregation of the particles and their Brownian motion in the suspension. An overview of group's research on magnetic nanomaterials and their applications in the separation of nucleic acids (DNA and RNA) from the biological cells [1,2] will be presented in connection with an industrial collaboration with Q-Bioanalytic, Germany. The possibility of affinity interaction of biomolecules i.e. nucleic acid, protein, antibody, microorganisms etc. through hybrid capture will also be discussed in the context of food quality and hygiene in Bio-sensing [3}. The talk will also cover our recent results [4-6] on our on-going UKIERI project (www.uclannanomedicine.net) with Delhi University, Hosokawa Micron Ltd., UK and Royal Blackburn Hospital on Liver cancer therapy and diagnostics including cellular toxicity using magnetic hyperthermia [7-9]. The proposed talk is the outcome of our collaborative work and will be focused on academia, industries and clinical perspectives.

1. Sen et al "Novel Mesoporous Silica-magnetite: Fabrication and Applications in Magnetic Bio-separations" J. Am. Chem. Soc.128, 7130, 2006
2. Sen and co-workers "Extraction of DNA from Soil using Magnetic Bio separation" Let. Appl. Microbiol. 46, 48, 2008.
3. Sen et al "Surface engineering of Nanoparticles in suspension for particle based bio-sensing" Scientific Reports2: 564 | DOI: 10.1038/srep00564. 2014
4. Roy, Sen and co-workers "Iron oxide nanoparticles containing molecular optical probes for in-vivo biomedical applications" Nanomedicine (Lond.), 2020 (special issue under review)
5. Sen, Roy and co-workers "Iron oxides based magneto-optical nano composites: in vivo biomedical applications and their toxicity" Biomedcine2020 (special issue under review)
6. Roy, Sen and co-workers "Fluorescein-entrapped magnetosomes for magnetically assisted photo dynamic therapy" Nanomedicine (Lond.), 2020 (specialissueunder review)
7. Sen and co-workers "Drug loaded liposome capped mesoporous core-shell nanoparticles for cellular toxicity study." Nanomedicine (Lond.), 11 (21), 2757-2767, 2016
8. Sen and co-workers "Superparamagnetic iron oxide nanoparticles (SPIONs): Development, surface modification and applications in chemotherapy" Advanced Drug Delivery Reviews 63, 24, 2011.

BRIEF BIOGRAPHY

Dr Sen is an expert in nano chemistry and nano-biomaterials with more than 25 years research experience from laboratory scale development to commercial products. Currently he is working as a Reader in Nanomaterials Chemistry and leading the Nano-biomaterial Research Group (https://senlabs.org) in the University of Central Lancashire, UK. He is the principal inventor of PCT application of three Great Britain patents and has published more than 50 high impact peer reviewed journal articles of his original work, two high impact review articles, two book chapters and seven articles in books in the area of nano-biomaterials chemistry (Citations: https://scholar.google.co.uk/citations?user=pRmrxpcAAAAJ&hl=en). He managed several international research projects as a principle investigator in the past and successfully delivered two International workshops (https://nanowateratuclan.org/an-international-workshop-on-magnetic-nanoparticles/&https://uclannanomedicine.net/news-highlight/) and two international symposium "Functional Nanomaterials in Industrial Applications: Academic-Industry Meet" in March 2016 (https://nanosymposiumatuclan.net/) and "Functional Nanomaterials in Industrial & Clinical Applications: Academic-Industry-Clinician Meet" in July 2020 (https://secondnanosymposiumatuclan.net/) as a coordinator. His current research activity can be found via the link: https://www.youtube.com/watch?time_continue=6&v=ePLauSsqvdM

He is a Fellow of Royal Society of Chemistry and Higher Education Academy, UK. He is the member of the Editorial board of several peer review journals including Scientific Reports, Nature Publishing Group, a member of the peer review panel of the research council UK and Royal Society, UK. He hasalso completed a foundation degree in project management (PRINCE II) endorsed by the UK government as the project management standard for public projects