

## Introduction

Although much progress has been made in treatment of diseases and cancer for example this last decade, new approaches are necessary at the same time for improving existing therapies or developing new techniques of treatment in order to minimise deleterious side effects and to increase the patient survival rates. The fast growing research in nanoscale science and nanotechnology has brought many potential opportunities as well as challenges in innovations in medicine. The theme issue focuses on state-of-the-art on multifunctional nanomaterials designed for revolutionizing the field of diagnosis and therapy. The recent advances in new materials, advanced characterization, and new discoveries for therapy and early diagnosis are strong feature of the theme issue.

It is my great pleasure to edit this issue on “**Multifunctional nanostructures for diagnosis and therapy of diseases**”. It showcases the most up to date and exciting research, including reviews in this area from UK as well as many over sea countries (France, Spain, Italy, Hungary, Malaysia, Ukraine and Romania) and from different communities (organic chemistry, nanoparticles synthesis, material sciences, biology, physics, engineering and medicine).

Quantum Dots are still finding their way to biological applications in a great example of their conjugation with DNA, contributed by B. Dubertret group in France. Research on magnetic nanoparticles dominated the issue. A very important paper by E. Tombácz from Hungary shows correlation between the coating quality and colloidal stability on magnetic iron oxide nanoparticles in biorelevant solutions. Hemocompatibility tests were used to confirm this. The experimental issues related to the assessment of the magnetic heating properties of gold-iron oxide composites was presented by M. Casula et. al., from Italy. M. Filice et al., in Spain reviewed the preparation and application of single multifunctional iron oxide based nanoradiotracers in PET/MRI dual imaging as well as the synthesis and application of multifunctional theranostic liposomes. High gradient magnetic separation, low gradient magnetic separation techniques; linking the magnetic separation theory to biomedical diagnostic applications were reviewed by J. K. Lim and colleagues from Malaysia. The impact of biopolymer matrices on relaxometric properties of contrast agents and the tunability of hydrogel structures to improve magnetic properties of metal chelates open ways for new contrast agent development, as indicated by E. Torino et. al. from Italy.

The G. Barrera group showed the effect of nanodisks coated with or without the protective gold layer on cell growth. Their successful attempt to bind cysteine-fluorescein isothiocyanate (FITC) derivative to the gold surface of magnetic nanodisks has been exploited to verify the intracellular uptake of the nanodisks by cytofluorimetric analysis using the FITC-conjugate.

Robert Steve Conlan et al., in UK, reviewed the state-of-the-art for nanomedicines currently on the market and those being clinically evaluated for the treatment of gynaecological cancers. In particular, it focuses on antibody drug conjugates, and presents a methodology for their rational design and evaluation.

The usefulness of Raman spectroscopy, such as high chemical specificity, the ability to measuring raw samples and optical responses in the visible or near-infrared spectral range as a means with elevated potential in precise diagnostic in oncology surgery was reviewed by C.E. A. Grigorescu et. al., from Romania.

Fabrication, organosilane-functionalization and characterization of nanostructured ITO electrodes were reported by P. Raquel et al. from Spain. Silica carriers equipped with molecular and supramolecular pH-sensitive nanovalves were designed by combination of sol-gel synthesis and selective postsynthetic modification was studied/presented by N. Roik and L. Belyakova from Ukraine. Feasibility study on molecularly imprinted nanostructures for an enhanced polymer-based diagnostics was reviewed by S. C Low from Malaysia.

I would like wholeheartedly thanks all the authors for their enthusiasm for contributing their excellent research to this very diverse theme issue. May I wish you all the best wishes for your future work, and I am really looking forward to seeing the multifunctional nanostructures moving forward closer bed site for the benefit of patients. Finally, I would like to thank Tim Holt, the publishing editor, for making my life as easy as possible while I was editing this issue.

Professor Nguyễn T. K. Thanh FRSC MInstP  
Chair in Nanomaterials

Biophysics Group, Department of Physics & Astronomy  
University College London

Email: [ntk.thanh@ucl.ac.uk](mailto:ntk.thanh@ucl.ac.uk); <http://www.ntk-thanh.co.uk>