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Microcapsules modified with core–shell ferrite nanoparticles: Applications in drug-release

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In the context of biomedical applications, magnetic nanoparticles (MNP) have been applied due to three main relevant properties: i) MNPs can be manipulated using magnetic field gradients, ii) MNPs provide T2-weighted contrast in magnetic resonance imaging (MRI) and iii) MNPs produce heating upon excitation with alternating magnetic fields (AMF), which can be harnessed in hyperthermia treatment. Due to biocompatibility issues, iron oxides are the most common material employed for the fabrication of MNPs. However, besides size and shape, the magnetic properties of MNPs can be tailored by adjusting their composition, thereby optimizing their performance for a particular application. The motivation of this study is to synthesize size controlled composite core shell MNPs, where the core and the shell will be made of different magnetic materials, with maximal hysteresis losses under AMF. The MNPs will be then incorporated within the shell of multifunctional polyelectrolyte microcapsules. These hollow capsules fabricated using the LbL assembly technique are versatile multifunctional materials, which can be designed to: encapsulate different macromolecules in the cavity, entrap MNPs within the polymer shell, and present an engineered surface with specific properties (e.g., targeting, anti-fouling, etc.,). Ultimately, the capsules with MNPs in the shell and loaded with different macromolecules will be used as drug-release systems under AMF, as in previous own work where light was used as trigger.

Biography

Atif Masood is affiliated as a PhD student, with the Prof. Dr. Parak's AG Biophotonik group in the Faculty of Physics since October 2014. Prof. Parak's research group, is a renowned research group in the field of Nanobiotechnology. His PhD research mainly focuses on synthesis, development, stabilization, reliability and integrity of different types of nanoparticles; the purposeful functional characteristics of the physico-chemical properties of the nanoparticles; and the efficient applications of these nanoparticles in the field of oncology to trace the imaging.

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