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Superparamagnetic Iron Oxide Nanoparticles for Magnetic Hyperthermia Applications

Yogita Patil-Sen[a]
[a]University of Central Lancashire, UK

Superparamagnetic iron oxide nanoparticles (SPIONs) are of great interest due to their potential applications in hyperthermia, cancer therapy and targeted drug delivery. Hyperthermia is considered as a supplementary treatment to the conventional surgery, chemotherapy and radiotherapy, all of which lack specificity and suffer from tremendous side effects. The hyperthermia treatment is based on the fact that SPIONs, when exposed to a varying magnetic field generate heat due to magnetic hysteresis loss. Due to their superparamagnetic nature, when SPIONs are subjected to alternating magnetic field, the particles become powerful heat sources for killing cancer cells, which are more sensitive to temperature above 41 °C than the normal cells. The amount of heat generated by SPIONs is strongly dependent upon their magnetic properties, which in turn is determined by their physico-chemical properties i.e. size and shape. Although, typically particles in the size range of 10-20 nm show the best superparamagnetic properties, the major problem associated with such ultra-fine particles is their agglomeration, which reduces their dispersibility and hence their intrinsic stability over longer period of time. Coating SPIONs with biocompatible materials such as lipids, peptides and silica provides a good strategy to protect magnetic nanoparticles. However, coating of SPIONs may alter their magnetic properties significantly, which is undesirable for their bioapplications. Therefore, SPIONs should be coated in such a way that coating provides favourable characteristics preserving the desirable properties of SPIONs intact. Our research focuses on synthesis of various types of core-shell type nanoparticles for magnetic hyperthermia cancer therapy and drug delivery applications.

Biography

Yogita completed her PhD from the University of Manchester, UK under the guidance of Prof. Gordon Tiddy and Dr. Christine DeWolf. Currently, she is a Daphne Jackson Fellow at the University of Central Lancashire (UCLan) and her research is jointly funded by the Royal Society of Chemistry and UCLan. Yogita's research interests are in the field of synthesis of different types of nanoparticles for targeted drug delivery and cancer therapy. She has published nine research articles in high impact factor international journals. Yogita is a member of the Royal Society of Chemistry and the American Chemical Society.

ypatil-sen@uclan.ac.uk

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