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Fabrication of silica-coated hollow carbon nanospheres encapsulating Fe_3O_4 cluster for magnetically and MR imaging guided NIR light triggering hyperthermia and enhanced US imaging

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In this study, the yolk-shell silica coated iron oxide@carbon nanospheres (IONP@h-C) were synthesized to act as a multifunctional theranostic nanosystem for cancer treatments. IONPs were synthesized, and then encapsulated in the hollow carbon shell through the mixed micelles, polymerization, hollowing and carbonization processes. With a silica shell coating on IONP@h-C, the hybrid nanopaheres were able to escape from condensing and sintering consequence, causing aggregation, through the annealing process. The dispersed nanospheres in aqueous solution were eligible for biomedical studies *in vivo*. The graphitic carbon shell displayed near-infrared (NIR) absorption and were susceptible to photothermal hyperthermia upon NIR light irradiation. Because of the presence of the magnetic IONP, the mice bearing malignant tumors were subject to magnetical and magnetic resonance imaging guided photothermal ablation of tumors. Furthermore, the void of the IONP@h-C has allowed us to load low boiling point of perfluorohexane. Because of the heating effect derived from IONP@h-C exposed to NIR light irradiation, the vaporization of perfluorohexane has given the additional echogenic source for ultrasound imaging (US). Therefore, the *in situ* US imaging can be monitored upon NIR light exposure on the tumor sites.

Biography

Yun-Kai Huang has completed his BS degree from National Cheng-Kung University (NCKU), Taiwan and Master's degree in Department of Chemistry from the same university. His research mainly focused on the synthesis and applications of nanomaterials.

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