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Synthesis of nano iron-copper core shell by using K-M reactor

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In this study, nano iron-copper core shell was synthesized by using Kinetic energy micro reactor (K-M reactor). The reaction between nano pure iron with copper sulphate pentahydrate (CuSO4.5H2O) beside Na CMC as stabilizer at K-M reactor gives many advantages in comparison with traditional chemical method for production of nano iron-copper core shell in batch reactor. Many factors were investigated for its effect on the process performance such as initial concentrations of nano iron and copper sulphate penta-hydrate solution. Different techniques were used for investigation and characterization of the produced nano iron particles such as SEM, XRD, UV-Vis, XPS, TEM and PSD. The produced nano iron-copper core shell particle using micro mixer showed better characteristics than those produced using batch reactor in different aspects such as homogeneity of the produced particles, particle size distribution and size, as core diameter 10nm particle size were obtained. The results showed that 10 nm core diameter were obtained using Micro mixer as compared to 80 nm core diameter in one fourth the time required by using traditional batch reactor and high thickness of copper shell and good stability.

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Applications of smart nanomaterials in cancer therapy

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Gold nanoparticles (GNPs) in particular have been extensively used in cancer research due to their ability to act as an anti-cancer drug carrier and as a dose enhancer. Our previous studies *in vitro* at monolayer cell level have shown that NPs of size 50 nm shows the highest uptake among the size range 14 - 100 nm. However, recent studies on NP transport through tissue-like structures showed that smaller NPs (14 nm) penetrates better through the tissue compared to larger (50 nm) NPs. Hence, we modified the surface of smaller NPs using a peptide containing integrin binding domain (RGD) to enhance the uptake of smaller NPs. We have shown that peptide modified NPs had a higher uptake leading to enhancement in radiation dose and improved drug delivery. This would lead to more effective combined treatment for therapy resistant aggressive cancers. Hence, it is possible to innovate smart nanomaterials for improved outcome in future cancer care.

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