Geometrical control of Fe_3O_4@Au core-shell hollow nanoparticles for application of photo-immune therapy on melanoma

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It is important to prepare the synthesis methods with the controllability of materials' shape and size. Especially for the fabrication of complex and intelligent materials (e.g., artificial biomaterials, semiconducting materials, functionalized materials, or biosensors), these will be critical components to consider. In this study, we demonstrate morphological controls in core@shell magnetic nanoparticles (SPION@Au) that include superparamagnetic iron oxide nanoparticles (SPION) in a core and gold (Au) layer as a shell. We describe a strategy for controlling the shape of Fe_3O_4@Au nanoparticle depending on the various charges of surfactant and on the effect of halide ions. Then, conformational characteristics of SPION@Au is optimized to perform plasmonic photothermal therapy on a tumor model. Here, we introduce a strategy of tumor immune therapy using modified SPION@Au with near-infrared (NIR) irradiation, and immunecheck point inhibition on the melanoma model using a lectin protein. We show that specific glycan expressed on CD24 known as a promising immuencheck point can be blocked by lectin conjuaged SPION@Au and it induces immune activation on macrophages.