

Synthesis and Application of Multi-Functional Mesoporous Silica Nanoparticles toward Immunotherapy

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Recently, a lots of researchers focus on the immunotherapy for overcoming cancer, infection, autoimmunity, and so on. Along with the development of nanotechnology, these research trends are accomplished progression to immune-nano-bioengineering. Especially, based on mesoporous silica nanoparticles(MSNs), changes of physical and chemical properties and composition of theragnostic function realize in engineered silica nanocomposite. These multi-functional mesoporous silica nanomaterials become one of the best candidates to apply various immunotherapy areas. Firstly, a facile method to control pore size of MSNs that included extra-large pore mesoporous silica nanoparticles (XL-MSNs) embedding superparamagnetic nanocrystals was demonstrated. The synthesized functional MSNs contained with ROS scavenging cerium oxide nanoparticles were applied to treat intracerebral hemorrhage by immune-suppression. And, the use of XL-MSNs as a cancer vaccine through the delivery of protein antigen and danger signal to host were demonstrated in cancer vaccine. Finally, the immune-modulation properties of XL-MSNs were demonstrated by delivering IL-4 cytokine to convert macrophage phenotype.