

Techniques in Theranostic ORMOSIL Nanoparticle Fabrication for Cancer Therapy

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Organically Modified Silica (ORMOSIL) nanoparticles have been studied for chemotherapeutic, photodynamic, gene delivery and bioimaging applications, and have improved pharmacokinetic properties, controlled release of the drug and lowered toxicity. This project emphasizes on making ORMOSIL through two different approaches to generate drug encapsulating medium for theranostics. The quality of these nanoparticles is determined by measuring the size, polydispersity index (PDI), and the quantity of functional groups on the surface. The size of nanoparticles is critical to take advantage of the Enhanced Permeability and Retention Effect (EPR) of most tumors, which makes size optimization an integral aim for this project. These nanoparticles are synthesized within an oil-in-water nanoemulsion medium. Once the optimal synthesis has been achieved, the second phase of the project can start, which involves amine functionalization by addition of APTES for later labeling with an optical imaging agent. Expected results involve an average nanoparticle population of ~50 nm, with a PDI of 0.150, an indication of high particle homogeneity. Dynamic Light Scattering (DLS) was used to characterize the synthesized nanoparticles. Below the concentration of the surfactant, the nanoparticles were too large to effect the drug delivery applications.