Sonochemical synthesis of $Ru(bpy)_3^{2+}$ encapsulated silica nanoparticles and its bioanalytical applications

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Recently, optical analysis using organic-based fluorescence dyes have been used widely in both chemical and bioanalysis applications. However, the problems such as the stability and price of organic-base dyes have been obstacles to wide applications. Therefore stable and cheap inorganic materials have been searched attention as alternative materials for organic-based dyes in chemical and bioanalysis. Among them, $Ru(bpy)_3^{2+}$ (byp = bipyridine) would be one of the most promising materials. The use of $Ru(bpy)_3^{2+}$ will benefit from the incorporation into silica matrix due to the excellent optical and mechanical properties of silica. Further development of these inorganic dye-encapsulated silica nanoparticles is expected to provide a variety of advanced tools for molecular biology, genomics and diagnosis, and therapy of infection. In this study, we synthesized the fluorescence dye-encapsulated silica nanoparticles by sonochemical method using $Ru(bpy)_3^{2+}$. The dye-encapsulated silica nanoparticles are characterized and analyzed with TEM, UV/VIS spectrometer and other tools.