

## The fabrication method of dye-encapsulated silica nanoparticles and its applications in security printing

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Recently, fluorescence dyes have been used widely in laser materials, nonlinear optical materials, and security printing applications due to the high photostability. In order to use fluorescent dyes in security printing, several properties such as high quantum yield, stability in long-term photo stability and non-toxity are required. This must also be cheap in order to apply to checks, passport, especially bank note. Among various kinds of fluorescent dyes, Ru (bpy)<sub>3</sub><sup>2+</sup> and BBOT are selected and encapsulated with silica nanoparticles by 'water-oil' method in order to satisfy the requirements. The dye-encapsulated silica nanoparticles are characterized and analyzed with transmitting emission microscopy (TEM), fluorescent spectroscopy and other tools. In this study, we use the dye-encapsulated silica nanoparticles which have different emission wavelength to make a security pattern. Because the particles emit different wavelength under UV radiation, it is possible to distinguish different patterns by selectively filtering the lights emitting simultaneously with cellophane papers. The possible application of these particles in security printing to protect from a counterfeit bank note, checks.