Intense red-emitting upconversion nanophosphors with core/shell/shell structure

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Since upconversion nanophosphors canconvert low energy near infrared (NIR) light into high energy visible light,they can be applied to various application field including solar cells andbio-imaging. In particular, upconversion nanophosphors have high potential forbio-imaging applications because NIR light, which is excitation source, doesnot induce autofluorescence from biomolecules, resulting in clear fluorescenceimage with high signal to noise ratio. Due to this advantage, there have beenmany reports on upconvcersion nanophosphors for bio-related applicationsincluding cancer cell imaging and photodynamic therapy. However, many reportsdeal with green-emitting upconversion nanophosphors doped with Yb and Er. Theupconversion green light does not lie in biological transparent window, and theupconversion green light can be absorbed by biomolecules and they can induceautofluorescence from the biomolecules.

On the other hand, upconversionred light whose peak wavelength is longer than 630 m lies in biologicallytransparent window and the upconversion red light can minimize theautofluorescence. In this study, red-emitting upconversion nanophosphors dopedwith Ho^{3+} ions are reported. Because this upconversion red lightintensity is weaker than upconversion green light intensity, core/shell/shellsturcutre was introduced to enhance the red emission intensity. Formation ofcore/shell/shell structure was confirmed by energy dispersive X-rayspectroscopy. And the core/shell/shell upconversion nanophosphors showed brightred light under NIR light excitation. In this presentation, structural analysisand luminescent properites of the red-emitting core/shell/shell upconversionnanophosphors will be discussed.

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