

Localized surface plasmonic effect for Second harmonic generation of silica coated ZnO

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ZnO has attracted more and more interesting for its wide applications in optoelectronic devices based on the high room temperature light emission efficiency and very good crystalline quality. On the other hand, ZnO has non-centrosymmetric structure, so it also showed outstanding properties in nonlinear optical processes such as the second harmonic generation (SHG) and two photon excitation (TPE). Nonlinear optical processes can achieve high special resolution and high quality imaging because of the longer penetration length and smaller focus volume in the applications of bio-environment. The longer wavelength near infrared incident light will infiltrate deeper into the material, resulting in the construction of 3-D imaging as well as avoiding the light scattering and auto florescence which limited the resolution for Florescence microscope

Comparing with ZnO NPs, the silica coated NPs have some befits, such as : experimental results suggest that silica coating can reduce the toxicity; Silica coating is used to increase dispersibility of ZnO NPs for water or saline and The PH value of silica coated NPs are more similar as the life environment.

By using some metal particles local surface plasmonic modes to change the local area electric field, we can increase the nonlinear optical processes properties. The lower nonlinear process efficiency requires the significant high incident power for both SHG and TPE which will lead to the damage for bio-samples. Our work showed that Ag nanoparticles significantly increased the SHG efficiency at resonant frequency. The figure is the SHG image for Silica coated ZnO.

