

Balázs Borbás: Synthesis and Characterization of Upconverting Nanoparticles in Suspensions and Chitosan-Matrix Thin Films

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Recently, the application of upconverting nanoparticles (UCNPs) in photodynamic therapy and solar cells has an ever-growing potential. Via anti-Stokes emissions shown by UCNPs near-infrared light is converted into visible and UV light. The emitted photons can later be absorbed by dye molecules, and the dye molecules then transfer this energy to a semiconductor material, e.g. TiO_2 . In our research, we focused mainly on the effect UC emissions have on fluorescent dye molecules and the photocatalytic effects of titania. NaYF_4 : 20% Yb^{3+} , 0.5% Tm^{3+} upconverting nanoparticles were prepared via solvothermal synthesis. Both ethanolic and water-based suspensions showed intensive anti-Stokes emissions under NIR excitation. UCNP-containing thin film model systems were prepared using water-based chitosan-matrix and spin-coating method. The thin coatings showed significant UC-emission intensities.

Experiments on the upconversion induced photodegradation of R6G via titania nanoparticles were conducted, the UCNPs showed energy transfer with both R6G molecules (Figure 1) and TiO_2 nanoparticles under 980 nm excitation.

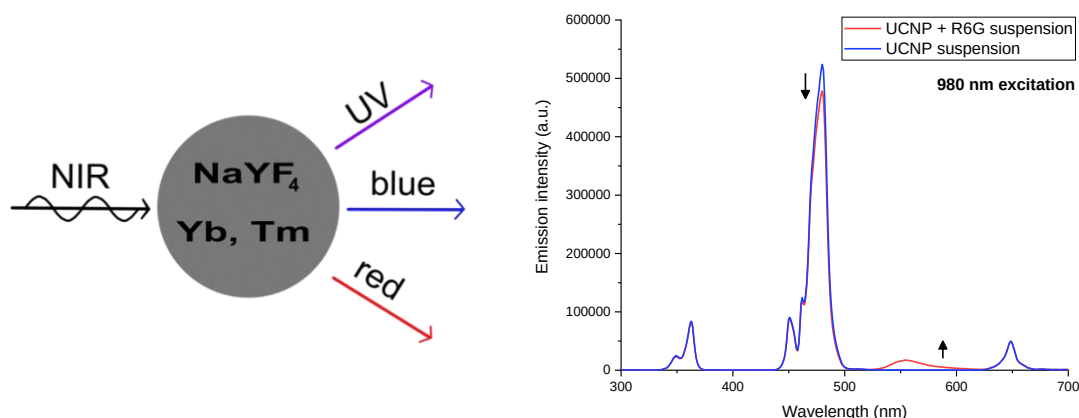


Figure 1: The upconversion phenomenon and the energy transfer between UCNPs and R6G molecules



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