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# Versatile organometallic synthesis of zinc oxide nanocrystals with controlled size, shape and optical properties.

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**Abstract:**

Organometallic synthesis has been successfully used to produce well defined ultrasmall metal and semi-conducting nanoparticles. We synthesized photoluminescent ZnO nanoparticles via the controlled decomposition of an organometallic precursor in presence of a ligand (octyl amine). The ligand controls the growth to a final diameter typically in between 3-6nm and coats the surface, thereby conferring a hydrophobic character to the nanocrystals.

The photoluminescent properties of the ZnO nanoparticles were thoroughly investigated. We demonstrated that the emission properties strongly depend on the surface state of the nanocrystals. Particularly, the fluorescence emission is modified when the amine ligands are exchanged, for instance with thiolated or acid ligands. A combination of NMR (DOSY and NOESY) and photoluminescent measurements were used to correlate the interaction surface-ligands with the photoluminescent properties.

Finally, we achieved the transfer of the hydrophobic nanocrystals to water, using a co-surfactant strategy. Here again, the interaction between the extractant and the nanocrystal surface were investigated using NMR. The photoluminescent properties of the water-soluble nanocrystals were characterized, in views of optical imaging applications.