Optical detection and spectroscopy of individual nano-objects

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In the fast evolving field of nanoscience, where size is crucial for the properties of the objects, simple and sensitive methods for the detection and characterization of single nano-objects are needed. The most commonly used optical techniques are based on fluorescence.

Luminescent nano-objects are studied at the single object level and inherent physical properties can be revealed. They are also routinely applied in various research domains ranging from quantum optics to life science.

An interesting alternative relies solely on the absorptive properties of the object. We have demonstrated a two-color photothermal heterodyne technique for the detection of small absorbing nanoparticles. This photothermal method has been applied to the detection of individual metal nanoparticles, quantum dots and single walled carbon nanotubes. The absorption spectroscopy of these systems at the single particle level is performed. This technique provides a unique potential to record arbitrary long trajectories of proteins labelled with a tiny gold nanoparticle.