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 luminescence. Single fluorescent nanoobjects have been studied on their own and are now routinely applied in various research domains ranging from quantum optics to life science. Yet, fluorescence methods allow only for short observation times due to inherent photo-bleaching. An interesting alternative relies solely on the absorptive properties of the object. In general, nanoparticles with large absorption cross sections and short time intervals between successive absorption events are likely candidates for detection with absorption methods. We have recently demonstrated a new 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, non-fluorescent quantum dots and single walled carbon nanotubes. The absorption spectroscopy of these systems at the single particle level is performed for the first time.