

Ultrafast processes in free nanoparticles

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Free nanoparticles are of primary interest for investigating in intense radiation fields the surface and bulk properties of well-defined nanoscopic matter including size effects without experiencing electrical charging and radiation damage. Photon-induced dynamics of free nanoparticles is briefly reviewed. The dynamics of photoemission, ion emission, and light scattering is reported, which involves radiation emitted from short pulse lasers as well as free electron lasers. Photon-induced processes occurring on different time scales are observed, which may range from picoseconds into the attosecond time regime. These reveal the dynamics of excited states, electron motion, electron emission, as well as molecular fragmentation. The experimental results are assigned by model calculations providing deep insights into the ultrafast dynamics of photon-induced processes.

The possible use of future cw-VUV-FEL radiation is subsequently discussed. Here, spectroscopic studies that are complementary to time resolved experiments are of primary interest, providing novel insights into the structure and dynamics of processes occurring on the surface and bulk of free nanoparticles.