Structure and dynamics of nanoparticles in short wavelength light pulses

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The interaction of high intensity, short-wavelength, short-pulse radiation with matter is a fundamental problem of current research[1]. Its understanding is essential for virtually all experiments with new super intense X-ray sources, in particular for flash imaging of nm sized particles. Clusters as finite systems with the density of bulk solids are ideal samples to study fundamental light–matter interaction processes in all wavelength regimes[2-5]. Recently, initial experiments with short wave length pulses have shown that single nm-sized gas phase particles and clusters can be imaged by single shot scattering[6-10]. Especially with free electron lasers new avenues are opened to investigate transition states[11] and ultrafast processes[12, 13] with unprecedented spatial and temporal resolution.

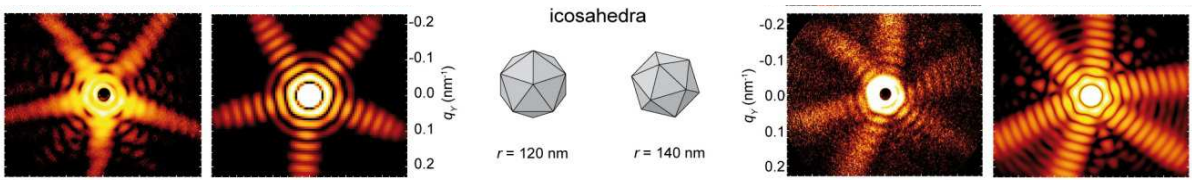

Fig. 1: Experimental and simulated scattering patterns of large silver nanoparticles [10].

While short wavelength radiation from hard x-ray sources is essential for the high spatial resolution, soft x-rays can provide 3D-information since the light also efficiently scattered to rather large angles[10]. This offers new routes for structure determination in cluster and nanometer-scale science.

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