NanoScience Seminar

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Metallic Ca colloids in CaF$_2$

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Single crystal calcium fluoride (CaF$_2$) is an important lens material for deep-ultraviolet optics and a key material in microlithography, where it is exposed to high irradiation densities. Especially for this application an extremely high laser stability is required. I will briefly discuss short term damage effects but focus on the description of long term laser damage structures. Spectroscopy measurements performed on high dose irradiated CaF$_2$ indicate the formation of precipitates in the optical material. We use Mie-theory to identify the underlying defect structures as metallic Ca colloids. Furthermore, we calculate the tensile stress and surface adhesion energy of Ca colloids embedded in a CaF$_2$ matrix. From these results we yield a rough estimate for a limit of stability of metallic Ca colloids in CaF$_2$. 

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