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**CFEL – Building 99, seminar room I+II (ground floor)**

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## Ultra-short laser induced confined microexplosion: A path to a new landscape of non-equilibrium material phases

New material phases formed under non-equilibrium conditions at pressures above  $10^{12}$  Pa and temperatures exceeding  $10^4$  K, the conditions of the warm dense matter (WDM), have become accessible using micro-explosions triggered by ultra-short sub-ps pulses, which are tightly focused in a micro-volume with cross sections comparable to laser wavelength. These are conditions favourable for the breaking and re-arrangement of atoms into unusual material phases. The accompanying isochoric quenching  $\sim 10^{14}$  K/s rates can keep the transformed material 'frozen' in unique atomic arrangements within the pristine structure. The laser affected material remains confined, readily available for the post-explosion investigation, in contrast to the shock wave method where the all pressure-affected material is dispersed after several nanoseconds of its lifetime.

In this talk a review of recent results on creation of new phases will be presented, namely, formation of super-dense bcc-Al inside sapphire, valence change of Fe-ions in olivine, formation of new tetragonal bt8 and st12 phases of Si, and formation of molecular oxygen inside voids at the microexplosion sites in  $\text{GeO}_2$  and  $\text{SiO}_2$ .

