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Laser melting experiments on chondrule formation processes

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Primitive meteorites contain many spherules of 0.1 to 2 mm in diameter which often dominate in mass. These so-called chondrules were formed in the early solar system and are witness of energetic processes in the time of planet formation. The process for creating this molten spheres is unknown and several different hypothesis with different physical processes are proposed. It is however certain, that the melting process has to be a rapid high energy event, followed by subsequent rapid cooling. It is the aim of this experiments to determine some constrains for this process. We simulate these conditions in laboratory experiments by melting a dust sample using a 30 W infrared laser. The samples are irradiated between 1 and 20 seconds at a pressure between 10^{-5} mbar to 1 mbar. The sample materiel is a powder mixture of SiO_2, MgO, CaO, Al_2O_3 and Na_2O, which is inspired by the composition of the material found in the chondrules today. Melting and subsequent solidification produced roughly spherical shapes. These spherules are between 0.3 to 3 mm in diameter. Many of the samples contain voids, which are untypical for chondrules. The experimental work is still in progress.