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Deformation features and oxygen isotopic compositions of chondrules in cluster chondrites

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Cluster chondrites (clch's) occur as lithic clasts (< 1 mm to 10 cm) in many unequilibrated ordinary chondrites (UOC's) and are characterized by close-fit textures of deformed and undeformed chondrules [1,2]. The investigation of 447 chondrules revealed that all chondrule textural types occur in deformed and undeformed shapes. A strongly deformed cryptocrystalline chondrule was investigated by TEM. The texture indicates crystallization during or after viscous deformation of the chondrule. A micro-CT scan of a clch clast revealed the described deformation textures in 3D space. The bulk oxygen isotopic compositions of 6 clch clasts extend the trend for bulk UOC's in the three-isotope diagram towards ¹⁶O-poor compositions. The oxygen isotopic compositions of 79 chondrules scatter along a mixing line with a slope of 0.64.

Conclusions: Only hours to a few days after their local formation and oxygen exchange with the surrounding gas, chondrules from clch's deformed in a hot stage, possibly due to collisional compression by continuously accreting hot material.

[1] Metzler, K. (2011) LPI Contribution No. 1639, 9111.

[2] Metzler, K. (2012) Meteoritics and Planetary Science
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