

Internal structure of chondrules from Allende CV3 chondrite

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In order to clarify 3D shapes and internal structure of chondrules in Allende CV3 chondrite, we have separated 180 chondrules grains and investigated them with X-ray CT apparatuses (Scan Xmate-D180RSS270, Scan Xmate-D160TSS105/11000) recently installed at the Museum of Natural History, Tohoku University. We also developed an optical device to measure 3D shape of chondrules or other spherical objects (Nishida et al. JPGU 2013). Our results revealed that chondrules shapes show wide distribution consisting of true spheres, prolate-spheres (rugby-ball shape) and oblate-spheres (pancake shape) (Tsuda et al. JPGU 2013). Chondrules with porphyritic textures distribute in all three shape categories. Chondrules with granular texture (lower melting degree than porphyritic) also show nearly homogeneous distribution. Chondrules with barred olivine texture (quenched from super-heated melt) show a distribution between true sphere and oblate-shape. Implication of the 3D shapes and internal texture of chondrules will be discussed from the shock-wave heating model (e.g., Miura et al., 2008).

Melting textures of Fe-FeS and silicates were observed by high-resolution X-ray CT (Scan Xmate-D160TSS105/11000). Coagulation processes of molten Fe-FeS melt in chondrules were observed. An example of cross section of a porphyritic chondrule is shown in Fig. 1, which shows "the smallest core formation process" in the early solar system. Our observation shows that 1) there are group of "chondrules" which have undergone melting of Fe-FeS only (peak temperature:1000-1200 degreeC), 2) coagulation and separation process of Fe-FeS and silicate takes place during short heating duration, 3) degassing of sulfur would be the main source of bubbles.

Keywords: Allende, Chondrule, internal texture, metal-silicate separation

