The Supercooled-Collision Model for Compound Chondrule Formation

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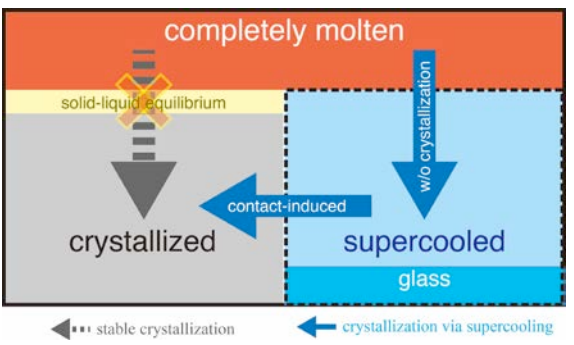
Three Features of Compound Chondrules

Compound chondrules in ordinary chondrites have several noteworthy features. First, round-shaped components of compound chondrules (which is called *primaries*) are as four times as large as deformed ones (which is called *secondaries*) [1]. Second, in most compound chondrules, both primary and secondary have non-porphyritic texture [1]. This fact means that components of compound chondrules have experience of complete melting [2]. Finally, approximately 20% of non-porphyritic chondrules are compound [3], and in contrast, only 0.5% of porphyritic ones are compound.



Crystallization of Completely Molten Precursors

We focus on a crystallization mechanism of completely molten precursors. Experimental reproduction of chondrules [4] revealed that completely molten levitated precursors do not crystallize at their liquidus or solidus but turn into supercooled droplets, and non-porphyritic chondrules are made by instantaneous crystallization of supercooled droplets triggered by a contact.

The Supercooled-Collision Model

We propose a novel model for compound chondrule formation. The supercooled-collision model can reproduce three features of compound chondrules due to long duration of supercooling [5].

[1] Wasson J. T. *et al*. (1995) *GCA* **59**, 1847. [2] Connolly Jr. H. C. *et al*. (1998) *GCA* **62**, 2725. [3] Ciesla F. J. *et al*. (2004) *MAPS* **39**, 531. [4] Nagashima K. *et al*. (2006) *Journal of Crystal Growth* **293**, 193. [5] Tanaka K. K. *et al*. (2008) *Journal of Crystal Growth* **310**, 1281.