NON-DESTRUCTIVE OBSERVATION OF STRUCTURE OF COMPOUND CHONDRULES BY X-RAY CT.

M. Uesugi¹, K. Uesugi² and M. Oka¹.
¹Department of Earth and Space Science, Graduate School of Science, Osaka University 1-1 Machikaneyama-cho, Toyonaka-shi, Osaka, Japan.
E-mail: uesugi@astroboy.ess.sci.osaka-u.ac.jp.
²Japan Synchrotron Radiation Research Institute (JASRI) 1-1-1 Kouto, Sayo-cho, Sayo-gun, Hyogo Japan.

Introduction: The configure of compound chondrules clearly shows that chondrules have different degree of melting at the time of chondrule formation[1-2]. Previous study showed that nearly 50 % of secondary chondrules, which lost their spherical shape due to the sticking, have higher liquidus temperature than primaries, which retain their spherical shape (Fig. 1).

![Fig. 1 Difference of liquidus temperature](image)

This feature indicates the inhomogeneity of temperature of chondrules during the heating event. If constituent chondrules in compound have different radius, they would have different cooling rate after the heating, and would have different temperature at the time of collision. We developed a method for high quality three-dimensional imaging of meteorite using synchrotron radiation X-ray CT, and observed compound chondrules inside several meteorites.

Experiment: The experiment was performed at BL20B2 of SPring-8, with X-ray energy 25-30 keV and pixel size 2.74 μm. Samples were cut into φ 4-5 mm chip and fixed on the rotation stage of X-ray CT. We observed 3 chips of Y-790448 (LL3), a chip of Allende (CV3) and a chip of Y-791717 (CO3).

Results and Discussions: The average radius ratio of a secondary chondrule to a primary chondrule is smaller than unity. This result shows that primary chondrules would experience slower cooling than the secondaries, so they would have higher temperature than secondaries at the time of collision. Moreover, some primary chondrules have higher bulk X-ray linear absorption coefficient (LAC). It might indicates that the primaries have higher bulk Fe contents than secondaries, and then the primaries have lower liquidus temperature than the secondaries. The structure is inconsistent, if they were formed in a single heating event.

These results might indicate that the primary and secondary chondrules formed in different heating events.