[JJ] Evening Poster | S (Solid Earth Sciences) | S-MP Mineralogy & Petrology

[S-MP38]Physics and Chemistry of Minerals

convener:Hiroaki Ohfuji(Geodynamics Research Center, Ehime University), Seiji Kamada(Frontier Research Institute for Interdisciplinary Sciences, Tohoku University)
Thu. May 24, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
In this session, we will discuss the physics and chemistry of the Earth and planetary materials (including amorphous and melts) based on the results obtained from various experimental methods such as X-ray diffraction, FT-IR, Raman spectroscopy, electron microscopy and computer simulations.

[SMP38-P05]**Metamorphic temperature analysis of H chondrites using revised Lindsley’s pyroxene thermometer**

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Keywords:H chondrite, Lindsley's pyroxene thermometer, Metamorphic temperature, Petrologic type

Many researchers have been discussing the thermal evolution models of asteroids (e.g., Wood,1979; Miyamoto et al., 1981; Yomogida and Matsui,1984; McSween et al., 2002). As important parameters for the thermal evolution models, the highest peak temperatures, ages, and cooling rates of meteorite parent bodies are mentioned (McSween et al., 2002). The peak temperature inside the parent body has been estimated using various thermometers (Olsen and Bunch, 1984; Nakamuta and Motomura, 1999; Kessel et al., 2002; Slater-Reynolds and McSween, 2005). Pyroxene thermometer by Lindsley (1983) has been widely used because it allows temperatures to be derived from both orthopyroxene (Opx) and clinopyroxene (Cpx) in the same meteorite. However, the temperatures determined from clinopyroxenes, especially for type 6 chondrites, are systematically 50°C to 150°C higher than those from orthopyroxenes (Nakamuta et al., 2017). The Lindsley’s pyroxene thermometer is made empirically for terrestrial rocks and therefore the kosmochlor component is not considered in the calculation. So, Nakamuta et al (2017) proposed the revised Lindsley’s pyroxene thermometer in which the kosmochlor pyroxene component is added to evaluate the effect of the component on the thermometry. They also showed that the difference in temperature between clinopyroxene and orthopyroxene in LL chondrites using the revised thermometer was less than 20°C.
In this study, we have attempted to estimate the metamorphic temperatures of H chondrites (type 5 to 7) using the Lindsley’s pyroxene thermometer revised by Nakamuta et al (2017). Here we report the results of the estimation.
The chondrite samples used were three H chondrite with different metamorphic degrees; Faucett(H5), Mluga (north)(H6), and NWA7875(H7). Polished thin sections of the three H chondrites were prepared and observed using transmitted and reflecting light microscopes. Then, chemical compositions of pyroxenes, olivines, and plagioclases in the three H chondrites were analyzed by an EPMA, JEOL JXA-8530F.
For Mluga (north)(H6), the mean temperature of clinopyroxenes (72 points) calculated by the revised method was 799 ± 48°C and that of orthopyroxenes (76 points) was 804 ± 37°C. The difference in temperature between the two pyroxenes was less than 5°C much lower than that from the original method. This suggests that the revised Lindsley’s pyroxene thermometer can be effectively used even in H chondrite meteorites. On the other hand, the temperatures of clinopyroxene for Faucett(H5) tended to vary more widely than Mluga(north)(H6).