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Type 7 及び Type 5 普通コンドライトに含まれる高圧相について
High-pressure polymorphs in Type 7 and 5 ordinary chondrites

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Most ordinary chondrites experienced shock metamorphism on their parent-bodies. Many kinds of high-pressure polymorphs occur in shocked ordinary chondrites, and their impact pressure conditions have been estimated based on a phase equilibrium diagram. Ordinary chondrite is classified into petrologic Type 3 to Type 7 based on the degree of thermal metamorphism. The parent-body of ordinary chondrite is expected to consist of Type 7, Type 6, Type 5, Type 4 and Type 3 from inner to outer portions based on Onion shell model. Many previous studies have tried to estimate impact pressure conditions recorded in Type 6 ordinary chondrite using high-pressure polymorphs. However, other Type ordinary chondrite such as Type 5 and 7 have been hardly investigated so far. A systematic investigation using all petrologic Types is required to reveal an impact history on the parent-body of ordinary chondrite. In this study, we tried to estimate impact pressure conditions based on high-pressure polymorphs in Type 7 and Type 5 ordinary chondrites.

Asuka 880844 H7, Asuka 880933 LL7, Yamato 790120 H7, Yamato 790960 H7, Jilin H5 and Bassikounou H5 ordinary chondrites are obtained for this study. Preliminary optical microscopic observations reveal that all samples except for Yamato 790120 H7 and Yamato 790960 H7 include shock-melt veins. So, we focused our investigations on Asuka 880844 H7, Asuka 880933 LL7, Jilin H5 and Bassikounou H5 samples. Both Type 5 and Type 7 consist mainly of olivine, Low-Ca pyroxene, plagioclase, nickel-iron alloy and troilite. Although shock-melt veins occur in all samples, high-pressure polymorphs were not identified. We expected that feldspars in and around the shock-melt veins become amorphous (maskelynite). However, Raman analyses indicate that only a few feldspar become maskelynite. It is expected that high-pressure and -temperature conditions were achieved during a dynamic event, and high-pressure polymorphs would be formed in and around the shock-melt veins once in Type 7 at that time. However, the high-pressure polymorphs would be back-transformed into their low-pressure polymorphs again because high-temperature condition was retained even if after the dynamic event. Accordingly, it is difficult to estimate shock pressure conditions recorded in Type 7 based on high-pressure polymorphs. We used only H type ordinary chondrite as a Type 5 sample. It is inferred that the parent-body of H type ordinary chondrite may be smaller in size compared to L and LL Type. The duration of high-pressure condition during a dynamic event depends on the size of an asteroid. It is likely that the duration of high-pressure condition on H type ordinary chondrite parent-body is very short so that a high-pressure polymorph could not form, implying that few high-pressure polymorphs form in H5 ordinary chondrite

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