SHOCK VEIN IN AN ENSTATITE CHONDRITE, ASUKA 10164.

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Introduction: The planetesimal collision is one of the most important processes in the solar system evolution. Shock veins in meteorites were formed through such process. High-pressure polymorphs of silicates, oxides, and phosphate have been reported from ordinary [e.g., 1], carbonaceous [2], and differentiated meteorites [e.g., 3, 4, 5], in relation with shock veins. These minerals provide constraints on the conditions of collisional process in the solar system. On the other hand, no high-pressure phases have been yet reported from enstatite chondrites. Although Kimura et al. [6] systematically studied silica polymorphs in EH and EL chondrites, no high-pressure phases were encountered. Recently, a shock vein was observed in an EH chondrite, Asuka 10164 (A10164) [7]. Here we present our preliminary results on this chondrite, focusing on the shock vein.

Petrography: Although A10164 is shocked, the sample includes abundant chondrules, which mostly consist of clinoenstatite and glassy mesostasis, with olivine, diopside, and a silica mineral. Opaque minerals in the host are Fe-Ni metal, schreibersite, perryite, troilite, niningerite, and daubreelite, which are typical of EH chondrites [8]. All these observations support the classification of A10164 as EH3 chondrite. The shock degree is S4, after the criteria by [9].

Shock vein: A shock vein, ~0.3mm in width, crosscuts the sample, and comprises fragments of fine-grained silicates, opaque minerals, and chondrule fragments. In the vein, we found coesite, identified by the characteristic Raman peaks at 521 and 268 cm^{-1}. All silica minerals in the vein are coesite. This is the first discovery of a high-pressure phase in E chondrites. Other high-pressure polymorphs of silicates were not observed in the shock vein, but further investigation is planned. On the other hand, the host does not contain any high-pressure phase. Chondrules include cristobalite, which is consistent with [6].

The occurrence of coesite indicates that A10164, as well as the other meteorites, experienced high-pressure condition during shock event. However, the stability of coesite indicates that the pressure condition for A10164 might have been lower than in other meteorites containing high-pressure polymorphs, such as ringwoodite and majorite. At any rate, our results suggest that all major chondrite groups contain high-pressure polymorphs. Therefore, heavy shock events commonly took place in the solar system.

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