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Jadeite in shocked L6 and H6 chondrites

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Feldspar in shocked meteorites transforms to its high-pressure polymorphs or amorphous (maskelynite). Synthetic experiments indicate that jadeite is a dissociation product of albite; albite = jadeite + silica [1]. Jadeite as a dissociation product of albite exists in and around shock-melt veins of shocked ordinary chondrites. However, the natures, occurrences and formation mechanism of the jadeite have not been clarified yet in detail. In this study, we observed jadeite as a dissociation product of albitic feldspar in and adjacent to shock-melt veins of the Yamato 791384 L6 (hereafter, Y-791384) and Yamato 75100 H6 (hereafter, Y-75100) ordinary chondrites by TEM subsequent to micro laser-Raman analysis and SEM observation.

We focused our investigations on six albitic feldspar grains in and adjacent to the shock-melt veins of Y-791384 and Y-75100. Raman spectrum corresponding to jadeite was recorded from the albitic feldspar in the shock-melt veins, implying that jadeite was formed subsequent to the breakdown of the albitic feldspar. Stishovite is the most likely silica phase because estimated shock pressure in the shock-melt veins of the Y-791384 and Y-75100 based on equilibrated high-pressure polymorph assemblage is ˜15 GPa or more [2-4]. However, stishovite was not detected from present albitic feldspar including jadeite. TEM images show that many massive or network-like assemblages of jadeite crystal exist in the albitic feldspar. Jadeite crystal is surrounded by amorphous material having pseudomorph texture. The chemical composition of the amorphous material are varied, and plotted between jadeite and silica phase. Recent high-pressure and -temperature synthetic experiments using albite as a starting material demonstrate that the nucleation rate of stishovite is significantly slower than that of jadeite [5]. Jadeite would crystallize from albitic feldspar subsequent to polycrystallization in solid-state. Absence of stishovite is due to the critical differences of kinetics between jadeite and stishovite.

References

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