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# High-pressure polymorphs in Gujba CB type carbonaceous chondrite.

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One of the most unambiguous evidences for shock metamorphism is a dense polymorph, high-pressure polymorph in and around the shock-melt veins and/or melt-pockets of shocked meteorites. Now, the existences of high-pressure polymorphs have been reported from ordinary chondrite, enstatite chondrite, ureilite, eucrite, iron meteorite, lunar meteorite, Apollo sample and Martian meteorite (e.g., Ohtani et al., 2004; Miyahara et al., 2014). On the other hand, it is widely accepted that carbonaceous chondrites were less shocked than ordinary chondrites, implying that high-pressure polymorphs would not be included in carbonaceous chondrites. However, Hollister et al. (2014) identified ringwoodite and stishovite from Khatyrka CV type carbonaceous chondrite. Shock metamorphism in carbonaceous chondrites may be overlooked or underestimated. CB type carbonaceous chondrite is a unique grouplet because it consists mainly of metallic Fe-Ni and chondrtic fragment (Weisberg et al., 2001). Although the origin of CB type carbonaceous chondrite has been under debated, some previous studies propose that it may be formed through a planetesimal collision (Weisberg et al., 2010). In this study, we investigated a high-pressure polymorph in CB type carbonaceous chondrite, Gujba to clarify its shock metamorphism history and origin using FEG-SEM, EPMA and laser Raman spectroscope.

We prepared a polished Gujba sample for this study. Gujba studied here consists of metal and chondritic fragment. Shock-melt veins occur widely between the chondritic fragments and metals. The major constituent minerals of the chondritic fragments are low-Ca pyroxene ($Fs_{1-5}$, $En_{89-98}$, $Wo_{0-6}$), Mg-rich olivine ($Fa_{1-18}$, $Fo_{82-99}$) and Ca pyroxene ($Fs_{1-13}$, $En_{41-66}$, $Wo_{32-57}$) based on EPMA analysis. Many mineral fragments and fine-grained chondritic fragments are entrained in the shock-melt veins. We confirmed the existences of many kinds of high-pressure polymorphs from such fragments and chondritic fragments adjacent to the shock-melt veins. Raman spectroscopy analyses indicate that olivine entrained in the shock-melt veins transform into wadsleyite. A small amount of ringwoodite is accompanied with some wadsleyite. Low-Ca pyroxene is replaced with akimotoite, majorite or probably bridgmanite. Minor Fe-rich olivine ($Fa_{39-40}$) and albitic feldspar ($Ab_{82}An_{13}Or_5$) are entrained in the shock-melt veins. Lamellar ringwoodite occurs in the Fe-rich olivine. The albitic feldspar is replaced with jadeite, lingunite or maskelynite. We also clarified the distributions of these high-pressure polymorphs in Gujba studied here. High-pressure polymorphs occur ubiquitously in and around the shock-melt veins, indicating that the parent-body of Gujba was heavily shocked. The metals, which consist of kamacite and minor FeS, show evidence for melting. Alternatively, we can also infer that Gujba is a part of shock-met veins induced by a collision.

References

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