Complex dynamic episode recorded in Chassignite NWA 2737
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Shergottite and Chassignite clans are expected to be heavily shocked compared to other Martina meteorites. Shock metamorphism of Shergottite clan has been investigated in detail so far, whereas that of Chassignite clan has been hardly clarified up to now. Northwest Africa (NWA) 2737 is one of Chassignite clans and appears to be dunite. The olivine grains of NWA 2737 are coarse-grained, and show dark black halos with the naked eye. Based on previous studies, the dark-colored olivine grains were formed by a dynamic episode. Although previous studies focused on the dark-colored olivine grains in NWA 2737, shock-induced melting textures and high-pressure polymorphs have not been investigated. Accordingly, we investigated the shock-induced melting textures and high-pressure polymorphs in NWA 2737 to clarify the dynamic episode recorded in Chassignite clans. NWA 2737 consists mainly of coarse-grained olivine, and minor amounts of low-Ca pyroxene, plagioclase and chromite. Several melt-inclusions occurred in the olivine grains, and some of them were melted again due to the concentration of stress induced by a dynamic episode. Olivine fragments are enclosed in the re-melted melt-inclusion, and dissociated into spherulitic (Mg,Fe)O and interstitial fine-grained clinopyroxene assemblages. It is expected that olivine was melted once by the dynamic episode, and subsequently (Mg,Fe)O and bridgmanite were crystallized from its olivine melt, the latter metastable bridgmanite inverted to clinopyroxene through subsequent high-temperature episode. Considering the olivine dissociation reaction, the expected shock pressure condition recorded in NWA 2737 is ~21 GPa at least. With increasing distance from the re-melted melt-inclusion, polycrystalline olivine crystal assemblage formed. The polycrystalline olivine assemblage would be the remnant of ringwoodite; metastable ringwoodite formed in the olivine grain by the dynamic episode, and back-transformed to olivine again through high-temperature but low-pressure conditions. Considering the phase transformation products of olivine, it is likely that two different high-temperature events are recorded in NWA 2737, suggestive of the complex dynamic episodes and ejection path from the impact site on the Mars.

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