ALBITIC JADEITE IN SIX L6 ORDINARY CHONDRITES (KAKOWA, CHANTONNAY, VIÑALES, OZERKI, NORTHWEST AFRICA 12841, AND CHUG CHUG 011).

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Introduction: Sodic plagioclase is common in both differentiated and undifferentiated meteorites. Under high temperature (HT) and high pressure (HP) shock-induced conditions, sodic plagioclase may follow several transformation paths, resulting in the formation of hollandite-structured lingunite [1], stoichiometric jadeite plus silica, or the recently discovered albitic jadeite [2,3]. Albitic jadeite, the Na-rich analogue of tissintite, is a highly defective clinopyroxene with excess Si accommodated in the octahedral M1 site, compensated by vacancies on M2 site. There is yet no information on whether albitic jadeite has a stability field or on how its synthesis conditions may vary from those required to form stoichiometric jadeite. Searching for albitic jadeite alongside other HP minerals is therefore potentially important for calibrating the *P*, *T* conditions implied by the presence and chemistry of albitic jadeite, eventually adding it to the list of pressure constraints for impact events [2,3]. We report here on the occurrence of albitic jadeite in shock veins from six L6 ordinary chondrites: Kakowa, Chantonnay, Viñales, Ozerki, Northwest Africa 12841, and Chug Chug 011. Kakowa (fall; 19 May 1858) is moderately shocked (S4/5) and unweathered (W0). Chantonnay (fall; 5 August 1812) is moderately shocked (S4) and unweathered (W0). Viñales is a recent fall (1 Feb 2019), moderately shocked (S3/S4) and unweathered (W0). Ozerki (fall; 21 June 2018) is moderately shocked (S4/5) and unweathered (W0). All of them were recovered quickly after their fall. Chug Chug 011 was found in 2018 in Chile; it is weakly shocked (S2), with very minor weathering (W1). NWA 12841 (find from 2010) is moderately shocked (S4) and shows minor to moderate weathering (W2).

Materials and Analytical methods: One polished thick section of Kakowa (NHMV-N6231), two polished thin sections of Chantonnay (NHMV-M5621 & NHMV-N9836), and one polished thin section of NWA 12841 (NMHV-O1154) and one polished thin section each of Ozerki, Viñales, and Chug Chug 011 (from private collections) were studied with a focus on melt veins (MVs). We used optical microscopy, scanning electron microscopy with energy-dispersive X-ray analysis and electron back-scatter diffraction (EBSD), electron microprobe (EPMA), and Raman spectroscopy (RS; 514 nm primary laser).

Results and Discussion: The albitic jadeite in Kakowa occurs as sub-μm lamellae within irregularly shaped felsic domains up to ~20 μm long; its empirical formula is $(Na_{0.65}Ca_{0.08}K_{0.05}\square_{0.22})(Al_{0.81}Si_{0.17}Fe_{0.02})Si_2O_6$ and Ca# [100×Ca/(Ca+Na)] is 10.5. In Chantonnay, the albitic jadeite occurs as a glassy pool surrounded by MV groundmass, with empirical formula $(Na_{0.42}Ca_{0.05}Mg_{0.11}\square_{0.42})(Al_{0.93}Si_{0.11})Si_2O_6$ and Ca# is 11. In Viñales, albitic jadeite occurs as <1-2 μm irregularly shaped crystals in a Na-rich glass pool, adjacent to a majorite-bearing MV. Its empirical formula is $(Na_{0.52}Ca_{0.06}Mg_{0.04}K_{0.01}\square_{0.37})(Al_{0.75}Si_{0.26})Si_2O_6$ and Ca# is 10.2. In Ozerki, albitic jadeite occurs as acicular to dendritic aggregates of crystallites (up to ~4-5 μm) within amorphized plagioclase glass or along plagioclase-pyroxene contacts; its empirical formula range is $(Na_{0.48\text{-}0.62}Ca_{0.07\text{-}0.08}K_{0.03\text{-}0.05}Mg_{0.00\text{-}0.08}Fe_{0.00\text{-}0.02}\square_{0.25\text{-}0.40})(Al_{0.77\text{-}0.81}Si_{0.14\text{-}0.23}Fe_{0.06\text{-}0.13})Si_2O_6$ and Ca# varies from 11.0 to 17.6. In NWA 12841, albitic jadeite occurs as sub-μm lamellae or as crystallized (~10 μm wide) irregular areas within MVs; its formula range is $(Na_{0.61\text{-}0.66}Ca_{0.07\text{-}0.08}K_{0.03\text{-}0.05}\square_{0.22\text{-}0.27})(Al_{0.81\text{-}0.83}Si_{0.16\text{-}0.17}Fe_{0.02\text{-}0.03})Si_2O_6$ and Ca# is from 10.2 to 11.3. In Chug Chug 011, albitic jadeite crystals (~1 μm long and ~200 nm wide) form a rim that completely surrounds plagioclase glass. Its formula range is $(Na_{0.49\text{-}0.64}Ca_{0.07\text{-}0.15}K_{0.03\text{-}0.05}Mg_{0.01\text{-}0.24}\square_{0.0\text{-}0.33})(Al_{0.62\text{-}0.86}Si_{0.04\text{-}0.18}Fe_{0\text{-}0.13}Mg_{0\text{-}0.21})Si_2O_6$ and Ca# varies from 10.0 to 24.0. The RS of the albitic jadeites in this study display spectra very similar to ordinary jadeite, with a major peak at ~700 cm^{-1} and several matching minor peaks, indicating that RS alone is not an adequate method to discriminate jadeite from albitic jadeite species.

Conclusions: Textural evidence indicates two possible mechanisms of formation of albitic jadeite in L6 chondrites, i.e., by crystallization from a melt and by subsolidus transformation. Furthermore, this work and previous studies [2,3] data suggest that albitic jadeite is usually but not universally subject to loss of crystallinity by electron beam damage, perhaps whenever Si in M1 exceeds 0.1 apfu. However, Ozerki and NWA 12841 are exceptions; these beam-stable occurrences imply that other factors (e.g., crystallite size) play a role. Since Raman spectroscopy alone may not allow to discriminate between jadeite, albitic jadeite, and other related species, we recommend seeking additional characterization by *in-situ* compositional analysis and/or structure-sensitive methods like EBSD.

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