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An occurrence of metastable cristobalite in spodumene-hosted crystal-rich inclusions from Jiajika pegmatite deposit, China

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ABSTRACT

Laser Raman spectroscopic analyses showed the occurrence of cristobalite, together with carbonic aqueous fluid phases, in the crystal-rich inclusions (CIs) hosted in spodumene in Jiajika pegmatite deposit, China. In these CIs, cristobalite always coexists with zabuyelite, and occasionally with other minerals, including calcite, spodumene, and possibly cookeite. The rare occurrences of cristobalite in plutonic rocks are commonly considered to be resulted from the lack of H₂O, which was thought to be the catalyzer for the conversion of cristobalite to quartz. However, this assumption is not supported by our observed coexistence of cristobalite with aqueous fluid in the CIs of Jiajika pegmatite deposit. The results of microthermometric analyses showed that the carbonic aqueous fluids in CIs had salinities of less than 7 wt% NaCl equivalent, in which the CO₂ phase(s) occupied 60~80 volume % with the bulk CO₂ densities of near 0.70 g/cm³. Therefore, the estimated internal pressure of CIs are between 200 and 290 MPa at the initial dissolving temperature of daughter minerals (cristobalite at ~400 °C), much lower than the entrapment pressures of at least 440 MPa. The occurrences of cristobalite in CIs could be ascribed to (1) the pressure decrease within CIs from the entrapment pressures of greater than 440 MPa

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