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Chromian Spinels in Listwaenite and Related Rocks in the Sartohay Ophiolitic Mélange , Xinjiang, NW China

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Listwaenite, carbonate-talc schist, and serpentinite of Sartohay ophioliticmélange, Xinjiang, northwestern China, contain variably altered chromian spinels. During the hydrothermal alteration from serpentinite to listwaenite through carbonate-talc schist, chromian spinels in serpentinite and carbonate-talc rock were preserved by magnetite rims, and might be prevented from metasomatism of hydrothermal fluid. The studied chromian spinels in serpentinite, carbonate-talc schist, and even undeformed listwaenite have similar chemical compositions with $Mg^{\#}$ [$Mg^{\#}$=molar Mg/(Mg+Fe^{2+})] ranging from 0.48~0.66 and $Cr^{\#}$ [$Cr^{\#}$ =molar Cr/(Cr+Al)] ranging from 0.39~0.65, which might be used as an indicator of original petrogenetic processes.These primary chromian spinels should form at high temperature (~1000 °C) in equilibrium with olivine containing ~Fo90.

However, magnetite rims of chromian spinels were decomposed completely in Sartohay deformed listwaenite. Textural and chemical variation of chromian spinels in deformed listwaenite records two stages of modification. The first stage had to take place during deep ductile shearing deformation to produce Fe^{2+}-rich chromite ($Mg^{\#}$ = 0.38~0.61, mainly in 0.46~0.55, $Cr^{\#}$= 0.60~0.86) under reducing conditions.The Fe^{2+}-rich chromite forms by loss of Al and Mg, and residual enrichment in Cr and Fe^{2+}. During the second stage, Fe^{3+}-rich chromite($Mg^{\#}$< 0.29, $Cr^{\#}$=0.85~0.98) replaced Fe^{2+}-rich chromite patchily under relatively oxidizing conditions. The alteration from Fe^{2+}-rich chromite to Fe^{3+}-rich chromite is characterized by a pronounced increase of $Fe^{3+\#}$($Fe^{3+\#}$=molar Fe^{3+}/(Fe^{3+}+Al+Cr), the values of $Fe^{3+\#}$ of Fe^{3+}-rich chromite and Fe^{2+}-rich chromite are 0.17~0.28 and 0.01~0.11, respectively), and a strong loss of Al and Mg without changes in Cr. In-situ LA-ICP-MS analyses of chromian spinels and altered chromites implies that contents of Ti, Zn, Mn, and V increase in Fe^{2+}-rich chromite relative to primary chromian spinels, while Ti and Zn continue to increase, Mn and V decrease from Fe^{2+}-rich chromite to Fe^{3+}-rich chromite.

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