New perspectives on the evolution of the Baft ophiolite melange using spinel: A textural and mineral-chemical approach

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The Baft ophiolite mélange, located along the northern edge of the Sanandaj-Sirjaz Zone, contains numerous serpentinite bodies with patches of vein-like chromite ore deposits including the Gushk mine. The serpentinite bodies contains various spinels, including chromite, Cr-spinel, ferritchromite, and magnetite. Spinel compositions and textures are used to interpret the evolution history of this ophiolite sequence with respect to magmatic origin and alteration. The composition of chromite (Cr# of 0.82-0.85 and Mg# of 0.61-0.65) from the massive ore deposit is characteristic of podiform chromitite and crystallization from boninitic magma. The chemical composition of disseminated Cr-spinel (average 39.8 wt. % Cr_2O_3 and 26.6 wt. % Al_2O_3) classifies the serpentinized harzburgite and dunite as Alpine type mantle residual peridotites that formd in a suprasubduction zone. Ferritchromite that is mantled by chlorite, is formed by alteration of Cr-spinel during the main serpentinization event. The main serpentinization event, characterized by mesh-textured serpentinites containing lizardite and chrysotile, likely occurred during seafloor metamorphism. Overprinting of the mesh texture by ferritchromite reveals that formation of ferritchromite might be associated with dissolution-reprecipitation after the main serpentinization event. Following the main serpentinization, infiltration of fluids caused the dissolution of ferritchromite and releasing Al^{3+} that reacted with serpentine and precipitated chlorite. Two generations of secondary magnetite can be recognized: syn-serpentinization magnetite that formed along lizardite, bastite, and chrysotile fibers and are associated with the main serpentinization event, and post-serpentinization magnetite that formed along antigorite blades and in the vicinity of Cr-spinel grains as idiomorphic magnetite. It seems that the formation of the later is associated with deformation and migration of Fe-rich fluids that occurred after the main serpentinization event.