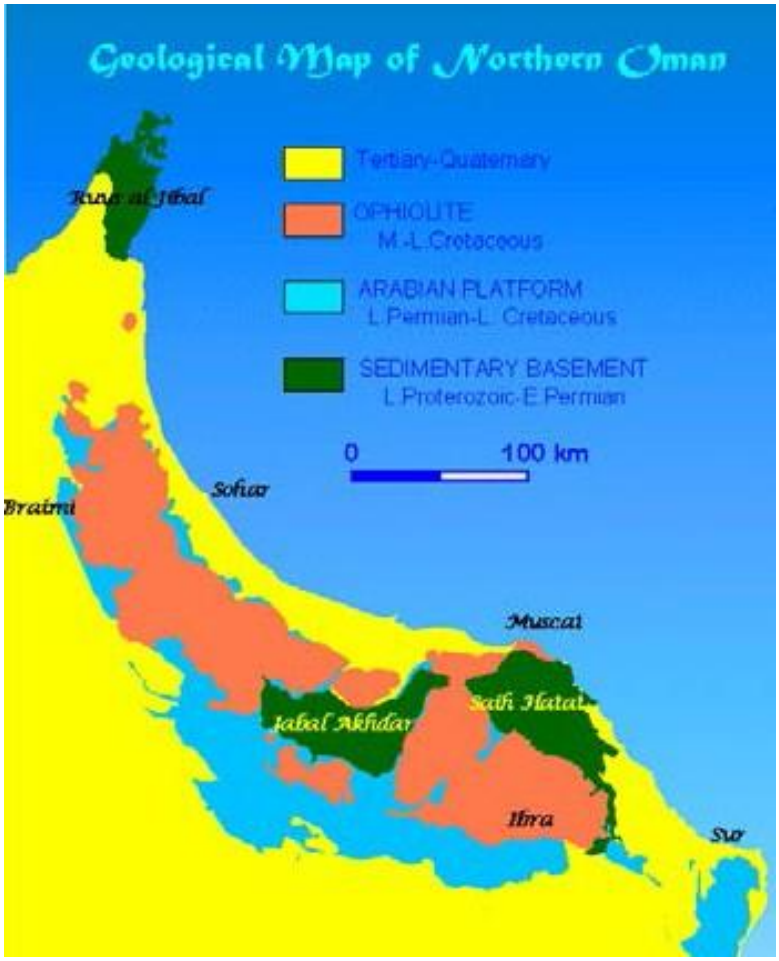
Abstracts of the 5th IGCP-649 Diamonds and Recycled Mantle Workshop and Field Trip in Oman

13th-22nd November, 2019



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Metallogeny of Serpentinite-Hosted Magnetite Deposits: Hydrothermal Overgrowth on Chromite or Metamorphic Transformation of Chromite?

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Abstract: Peculiar and rare occurrences of serpentinite-hosted magnetite deposits with mineable sizes are found in the Mesozoic ophiolites of Greece (Skyros), Iran (Nain and Sabzevar) and Oman (Aniba). These deposits have diverse thickness (from a few centimeters up to 50 m) and length (2 to >500 m). Magnetite ores show variable textures, including massive, nodular and banded ores, veins, net and fine-grained disseminations in serpentinites. Intriguingly, the investigated magnetite deposits can be mistaken for chromitite pods. Serpentinite-hosted magnetite deposits show three modes of occurrences including: (i) boulders strewn across the serpentinites (i.e. Skyros Island) (ii) ore bodies along the nonconformity contacts between serpentinites and limestones (i.e. Aniba); (iii) irregular and discontinuous trails of massive and semi-massive ore bodies within highly sheared serpentinite masses (i.e. Nain; Sabzevar). In all of these magnetite ore bodies, relicts of chromian spinel grains are occasionally enclosed in magnetite crystals. The chemistry of Cr-spinel relics found in these magnetite bodies are comparable to those of accessory Cr-spinels in the surrounding serpentinized peridotites. BSE images and elemental mapping revealed that magnetite occurs as a nucleation on chromian spinels but not being involved in reaction either with chromite or ferritchromite. Low-grade metamorphic transformation of chromite into Fe-chromite is documented along the cracks and fractures of a few chromite grains. Generally, magnetite has typical hydrothermal compositions, characterized by low Cr, V and Ti and high Mg and Mn. It is crucial to note that a few magnetite grains with metamorphic origin are characterized by high Cr and low Ti and Ni. The potential source of iron is essentially the Fe-rich olivine, We believe that multi-episodic serpentinization of peridotite systems at high fluid-rock ratios is the main process responsible for precipitation of magnetite at ore levels whereas low-grade metamorphic transformation of chromite to magnetite has minor contribution. Cumulative factors in generation of these deposits are modal volume of mantle olivine, peridotite composition, fluid chemistry, fluid-rock ratio, mechanisms of transportation and precipitation, structural controls such as cracks and shear zones.

Key words: serpentinite-hosted magnetite deposit, multi-episodic serpentinization, metamorphic transformation

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