HFSE-bearing phases in ophiolitic mantle chromitite bodies from eastern Cuba: mineralogical evidence of Fe-Ti type metasomatism of oceanic upper mantle

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Mg-rich ilmenite, Hf-bearing baddeleyite, REE-rich zirconolite, zircon, and rutile are important HFSE-bearing phases in chromitite bodies of Potosí Mine located in the Moho Transition Zone of the Cretaceous Moa-Baracoa supra-subduction zone ophiolite, eastern Cuba.

Such HFSE-bearing phases were found in the contact zone between chromitite and associated amphibole-bearing norites. In addition to HFSE-bearing minerals, the studied samples are composed of Fe- and Ti-rich chromite, orthopyroxene, plagioclase, olivine, Ti-rich (up 0.47 a.p.f.u.) pargasite and magnesio-hastingsite, F-rich apatite, Fe-Ni-Cu sulphides, sperrylite and laurite. Zirconolite crystals have the highest concentrations in Y_2O_3 (up to 11 wt%) reported so far in zirconolite from terrestrial occurrences, and relatively high REE contents (up to 10 wt% of REE_2O_3). Ilmenite contains up to 13 wt% of MgO, and compares well with Mg-rich ilmenite from kimberlites and orogenic lherzolite massifs. LA-MC-ICPMS U-Pb analyses of two Potosí zircon grains yield ages from 99 to 118 Ma, slightly younger than the age of ophiolite formation (125 Ma). Hf analyses on these zircons yield positive εHf(t) (+13), indicating derivation from a juvenile mantle source. We propose that HFSE-bearing phases, hydrous silicates and (probably) sulfides reflect the modal metasomatism triggered by infiltration of evolved Fe-Ti melt into the upper mantle section of the ophiolite.