were detected except for a generally lower Cr# for Rizo mine. All chromitite bodies independently of their texture (massive, schlieren or disseminated) are made of euhedral to subeuhedral chromite crystals with size varying mainly between 0.1 and 2 mm, with some rare nodular textures showing crystals of up to 5 mm in size.

Chromite from all studied mines shows some important features highlighting the presence of Fe-chromite and magnetite alteration. Sometimes completely altered chromites where only the shapes of the habits were preserved were detected. Fe-chromites show a wide range of compositions. They are characterized by an increase in Cr# and/or a decrease in Mg# compared to their chromitic cores. In spite of the low range of primary chromite compositions, Fe-chromite can span over the full range of possible Cr# increase and Mg# decrease. Extreme compositions comprise virtually MgO-free Cr-magnetites and virtually Al_2O_3-free chromites s.s. Anomalous compositions were also detected in few samples with high NiO and MnO contents. MnO content of primary chromite is very low and no MnO has been detected in silicate phases. Cr_2O_3-free magnetites are often found as small crystal within the serpentinite matrix and are not a product of alteration of chromite but are related to release of iron during serpentinization.

Fe-chromite always grows at the expenses of primary chromite as chromite and Fe-chromite together, drawing the shape of the original chromite crystal. The close association of Fe-chromite and chromian-chlorite (kammererite) independent of the degree of serpentinization of chromitite silicate matrix and peridotite host rock suggests that alteration of chromites pre-dates serpentinization.

Preliminary data on an anomalous chrome-spinel assemblage from Amanos Mountains serpentinites (Turkey)

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The present work deals with an anomalous spinel assemblage detected within serpentinite rocks, whose peculiar textural and geochemical patterns can provide new information on spinel genesis and transformation within mantle peridotites and serpentinites.

Spinel is an important accessory phase in mantle peridotites and serpentinites. It shows a wide range of compositions related to different processes and has been largely used as a petrogentic indicator. Due to its refractory character spinel has long been considered to reflect magmatic conditions of its formation, but in the last years studies pointed out changes in its composition also related to metasomatism, metamorphism and alteration.

Spinel occurring as an accessory phase within mantle peridotites is dominated by a strong Cr-Al trend, from Al-rich spinel ss. in high-pressure lherzolite to Al-poor chromite in massive chromitite bodies. The main controls on magmatic spinel composition are Cr exchange with pyroxene and re-equilibration with olivine. During metasomatic and metamorphic events the most common change in spinel composition is a depletion in Al associated with enrichment in Fe and/or Cr. When this process affects Cr-rich spinel (chrome-spinel or chromite) it leads to the formation of ferritchromite, usually as alteration rims around chromite grains. Ferritchromite can further evolve to chrome-magnetite and magnetite, always associated with the formation of kammaererite (chromian-chlorite) in the silicate matrix.

The spinels described in this study were found during exploration for chromite ore in the Amanos Mountains, about 15 km NE of Iskenderun, Southern Turkey. There ophiolite slices crop out below Mesozoic carbonates and cherts. Ophiolitic rocks are mainly composed of a serpentinite melange with some strongly tectonized gabbros. Serpentinites host several small chromitite lenses that underwent limited exploitation in the last century.

All but one of the chromitite bodies detected show a massive to densely disseminated texture with 30 to 80% modal spinel and the composition of a typical chromite from podiform chromitite bodies within ophiolite peridotite. Alteration to ferritchromite is widespread even if it never completely obliterates primary spinel composition at the crystal cores.

The exception to the described outline comes from a sample of chromitite which shares texture at the cm-scale with the other chromitites, i.e., millimetric euhedral spinel grains densely disseminated within a completely serpentinized matrix. Microscope observation shows a complex texture with strong zonation related to alteration of the primary spinel. The spinel crystals perfectly preserved their original shapes in spite of deep alteration and transformation occurred from rim to core. Primary spinel is preserved only as irregular core portions and is an Al-rich chrome-spinel with about 41 wt% Al_2O_3 and 27 wt% Cr_2O_3. The Al-rich core is surrounded by a porous rim of about 200-300 micron in thickness composed of Fe-rich chromite, with about 9 wt% Al_2O_3, 40 wt% Cr_2O_3 and 35 wt% FeO_{tot}. A second alteration rim, closer to the original crystal border, is highly porous and is made up of ferritchromite, with 5-7 wt% Al_2O_3, 30 wt% Cr_2O_3 and 31-35 wt% FeO_{tot}. Finally a thin rim, external and developed also in the fractures cutting the original crystal, consists of very anomalous Cr-magnetite. This Cr-magnetite shows a composition different from any spinels described in literature, with 35-37 wt% Cr_2O_3 and about 45 wt% FeO_{tot}, but still with 4-5 wt% Al_2O_3.

The silicate matrix is mainly fine-grained chlorite that is found also in the porosity within the original spinel crystals. Chlorite Cr_2O_3 content (1-1.5 wt%) is lower than that of kammaererite usually associated to ferritchromite. Relics of serpentine are found only in the matrix.

Tertiary magmatism in SW Bulgaria and Eastern FYR Macedonia: geochemistry, geodynamic setting and relation to mineral resources

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In the frame of an international joint research project SCOPES IZ73Z0-128089 of the Swiss National Science Foundation, we started a collaborative study of the geological processes in SW Bulgaria and Eastern FYR Macedonia and Serbia that are responsible for the Tertiary magmatism and the formation of important copper, gold, iron and lead/zinc ore deposits. The project is leaded by Dr. A. von Quadt and a team of the Institute of Geochemistry and Petrology, ETH-Zurich, Switzerland. It comprises three additional teams from Serbia (Belgrade University), FYR Macedonia (Stip University) and Bulgaria (Geological Institute of the Bulgarian Academy of Sciences).

The planned major tasks of the project are four: i) Fluid processes at the magmatic to hydrothermal transition in porphyry-style Cu-Au-(-PGE) deposits and in meso- and epithermal deposits in Eastern Serbia, FYR Macedonia (e.g. Buchim, Ilovitza, Kadiitza) and Western Bulgaria/Central Rhodopes; ii) Geochronology, magmatism and large-scale metallogeny of the Cretaceous ABTS belt and the Paleogene Serbian-Macedonian-Rhodope zone; iii) Deposit-scale geochronology, magma characteristics and mineralization; iv) Impact of the mining activity on environment and the social life.

Our work as part of the project is concentrated on the second and third tasks and will build the basis of two PhD theses. On the regional scale, together with our Bulgarian supervisors and consultants from the FYR Macedonian team, we want to understand the geodynamic environment and the generation of mineralizing magmas, using extensive radiometric age dating, igneous geochemistry and petrology. We started the sampling of magmatic and volcano-sedimentary rocks along two main E-W transects: i) from the region of Kyustendil in SW Bulgaria trough the whole Kratovo-Zletovo magmatic complex (transect Ruen-Kratovo-Zletovo); ii) from Simitli and Petrich region in SW Bulgaria to Buchim and Alshar in FYR Macedonia (transect Sandanski-Alshar). The sampling aims to include the oldest and the youngest varieties, as well as representative samples for the whole geological