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Chromite Grain Diameter (CGD) from the ore-hosting dunite of the Xerolivado-Skoumtsa chrome mine (Vourinos, Western Macedonia, Greece): implications for chrome ore exploration.

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The largest chrome-ore bearing dunite of the Vourinos Complex occurs within the Xerolivado-Skoumtsa Mine District. The host dunite body has a surface exposure of ~ 3 km² and extends at least 400m into the subsurface. The dunite body is hosted by harzburgite tectonite interfolded with the dunite body during ductile phases of deformation.

The Xerolivado-Skoumtsa mine is one of the world's largest ophiolite-hosted chrome deposits with a potential of 6 million tons of ore assaying at ~ 22 wt.% Cr₂O₃. Even so, chrome ore bodies compose less than 1% of the volume of the dunite body. Exploration consisted chiefly of expensive drilling programs.

A well-documented suite of chrome ores from the south sector of the mine were collected during the final years of its operation (1987-1988). Samples include twenty-seven (27) samples of serpentinite altered from primary olivine that originally coexisted with the chromite. Two types of serpentinitised dunite were distinguished: Type A samples are from serpentinitised dunite ~ 1 m from the ore bodies, and Type B samples are silicates infolded with the ores during original high-temperature mantle deformation.

Thin-polished sections were studied via optical microscopes (transmitted and reflected light). All chromite grains (2,776 total measurements) were photographed and measured in eight directions at angular resolution of 22.5°, starting from the maximum diameter. The average and median chromite grain diameter (CGD) was calculated for each sample.

These geometric analyses indicate that CGD decreases depending on the position (Type A or Type B) of the samples: the average and the median of the CGD were smaller in the serpentinites next to the chromite ore bodies (Type A) than those within consecutive chromite ore bodies (Type B).

A decrease of the average and median CGD was found in (today's) vertical ore dimension: samples from mine level 717m have larger average and median CGD than samples from over-lying mine level 738m and from the underlying mine level 692m. This concurs with the position of the thickest size of the ore bodies, decreasing towards the overlying levels and underlying levels.

The grain size of chromite in these dunites is due to a combination processes of original Cr-spinel crystallization and grain break-up and deformation concurrent to original dunite thinning around the ore layers. With the lack of preserved olivine morphology, these structures are the only "fingerprints" of the type of deformation undergone on grain scale. These results could provide a "petrographic tool" useful for the exploration of schlieren-type chrome ores: host dunite (serpentinite) samples present lower average and median CGD when they are found closer to the ore bodies. Future research on this subject should focus on the verification of the results in other similar ore-hosting dunites and mineralogical and/or metallogenetic interpretation of the numeric results.