Monitoring the formation of ferrian chromite by μXANES

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Iron μXANES spectra were adquired at the K-edge (7112 eV), using a Si (311) monochromator, on chromite grains with different micro-structures (partially altered, porous, zoned and homogeneous). Spectra were collected in fluorescence and transmission mode simultaneously with a beam size of 2x1μm^2. Results show that $Fe^{3+}/(Fe^{3+}+Fe^{2+})$ ratio of homogeneous chromite and partly altered chromite rims is very homogeneous varying from 0.7 to 0.8 and from 0.3 to 0.4, respectively. This ratio becomes more variable in zoned chromite (0.3-0.8) and porous chromite (0.3-0.9). The latter shows heterogeneous distribution of Fe^{3+} and Fe^{2+}: whereas Fe^{2+} tends to be evenly distributed in chromite grains (except near fracture walls) Fe^{3+} concentrates along fracture walls and highly fractured zones.. Assuming that Fe^{2+} and Fe^{3+} were supplied together to porous chromite by fluids circulating along fracture networks, these results suggest that Fe^{2+} diffuses faster than Fe^{3+} in spinel-type structures. A supply of Fe^{2+} and Fe^{3+} under increasing fluid/chromite ratios results in the formation of zoned and homogeneous ferrian chromite. Our new data provide additional constraints for the two-stage model of formation of ferrian chromite during metamorphism as suggested by [1]. In this model, the formation of ferrian chromite takes place once magnetite component is suplied to the previously formed porous chromite. In addition, our results further constrain the formation of homogeneous ferrian chromite in systems where fluid infiltration is favored by chromite deformation.[2] .

[1] Gervilla, Padrón-Navarta, Kerestedjian, Sergeeva, González-Jiménez & Fanlo (2012), *Contrib. Miner. Petrol.* **164**, 647-657; [2] Satsukawa, Piazolo, González-Jiménez, Colás, Griffin, O'Reilly, Gervilla, Fanlo & Kerestedjian (2015), *Lithos* (in press).