

## **Backscattered Electron Image (BEI), Forescatter Orientation Contrast Image (FOC) and Image Quality Mapping (IQ): useful data during the investigation of mineral microstructures, the magnetite example.**

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We have observed the presence of distinct internal and external boundaries or edges, such as limits of grains, microcracks, microfractures and transformed regions in single magnetite crystals through the description of three types of image: Backscattered Electron Image (BEI), Forescatter orientation contrast images (FOC) and Image Quality Mapping (IQ). The motivation of this work is to identify important microstructural features of magnetite through the various types of image generated using a SEM-EBSD system. The images were taken from natural iron ore samples from the Quadrilátero Ferrífero, Minas Gerais, Brazil, one of the most important metallogenic provinces of world. These rocks are composed mainly by idiomorphic magnetite crystals, granular quartz and prismatic hematite. All samples were prepared using a sequence of mechanical and chemical polishing. The samples were firstly pre-polished with silicon carbide papers (down to 1200 grit), polished with 9-, 3- and 1 $\mu$ m diamond pastes during 30 minutes and colloidal silica (slightly basic ph) for 4 hours. Analyses were accomplished with the Channel 5 software package/OXFORD-HKL EBSD system mounted on a JEOL 5510 SEM. Visual inspection of the generated images have shown that the observation of only one kind of image is not satisfactory for a correct characterization of the microstructures observed in magnetite. Contrast in BEI maps is related to different atomic weights of the analyzed phases and therefore a good definition of the shape of magnetite crystals is only possible in the presence of a quartz matrix. On the other hand, FOC images are very helpful in the definition of microstructures in polycrystalline aggregates of magnetite and hematite [1] whereas conventional IQ are suitable for observation of the grain boundaries and evaluation of internal strain producing a clear phase and topographic contrast between magnetite crystals and the surrounding phases. We conclude also that IQ is a good source of information about magnetite microstructures, but complementary analyses through combination of BEI and FOC are necessary for a clear definition of grain boundaries.

### References:

[1] S. Wright and M. Nowell, *Microscopy and Microanalysis*, 12 (2006) 72–84.