Estimation Of The Phase Ratios In Hemo-Ilmenites. Influence Of The Image Acquisition Conditions.

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The possibility of estimating phase ratios in materials is one of the most obvious advantages of image analysis over chemical analysis. From Delesse's basic stereological principle, it appears that area fractions in images of random sections are unbiased estimators of volume fractions in the real three dimensional material. Spitefully, as simple as this may seem the practical computation is not free from errors.

First of all, the quality of phase ratio estimation is largely dependent on the global contrast that can be obtained from the phases to be studied. In optical microscopy, particular attention must be given to the sample polishing method, the source light, the optics, the video camera, and the use of wavelength selective filters. If results are not satisfactory, than other modes of imaging like *Backscattered Electrons Imaging* or *Energy Dispersive X-Ray Imaging (EDX)* may be tried.

Secondly, the best local contrast between phases must be searched for. Even when two phases have non-overlapping brightness ranges in the image, the grey-level transition from the one to the other may seem fuzzy and the true boundary will therefore be hard to locate. In order to reduce the fuzziness of boundaries the image acquisition conditions are much more important than any other subsequent image processing filter.

Finally, given the best possible image for a material, the software extraction procedure still plays an important role on the bias of the phase ratio estimation. Slight modifications in the parameters used in « Thresholding » or « TopHat » transforms yield different results.

This approach of searching for optimal image acquisition conditions and optimal parameter adjustement in phase ratio estimation has been tried on Hemo-Ilmenites with phase ratios (H/I) in the range of 12% to 25%. Although, the mean reflectance shows significant differences (16% of the camera dynamic range), the relative precision in estimation is poorer than 22% if no particular care is taken.

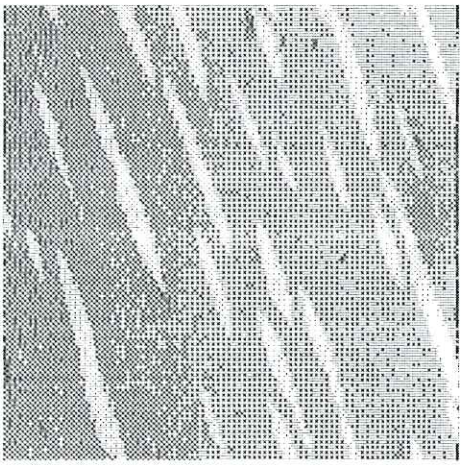

Figure 1 Reflected light Image of Hematite exsolutions in Ilmenite grains (200x).

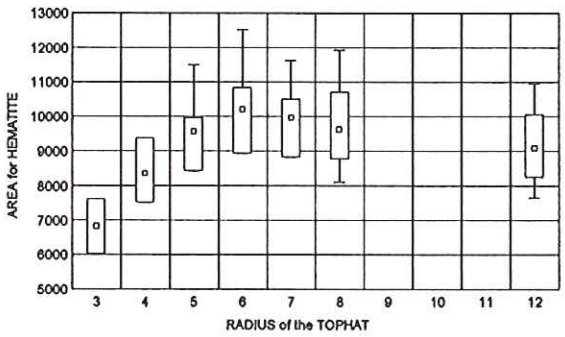

Figure 2 Evolution of the Hematite ratio with respect to the radius used in the TopHat thresholding procedure.