Quantitative analysis of electron diffraction ring patterns using MAUD. P. Boullay,[1] L. Lutterotti,[2] and D. Chateigner[1]
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The growing interest on nanosized polycrystalline samples raises problems such as phase identification, structure and microstructure characterization with quantitative and reliable approaches. In the transmission electron microscope, the diffraction from nanoscale polycristalline samples generates electron diffraction ring patterns (EDRP) similarly to X-ray powder diffraction. In the present work, the authors would like to present some new features of the MAUD program [1] targeted towards the quantitative analysis of EDRP by exploiting methods already used in X-ray and neutron powder diffraction.
The data collection is performed using a parallel beam illumination from an area ranging from about 200µm^2 down to 1µm^2 provided the number of diffracting particules is sufficient to give a EDRP. The diffraction patterns collected with a CCD are transformed in line profile patterns using an ImageJ plugin that allows integrating azimuthally the intensity along the rings by sectors (caking in n patterns, each covering an angular range of 360/n°). Once the camera length and instrumental profile function are known, quantitative information such as cell parameters, average size and shape of an assembly of nano-particules can be obtained from only one EDRP. Texture effects and a certain amount of graininess in the ring patterns can also be accounted for. In the case of texture analyses, several diffraction patterns collected for different orientation of the sample can be treated simultaneously (see also [2]) in order to obtain an Orientation Distribution Function (ODF) taking advantage of the advanced texture analysis methods offered by MAUD and going beyond the March model.

[1] L. Lutterotti, Nuclear Inst. and Methods in Physics Research B, 2010, 268, 334. [2] M. Gemmi, M. Voltolini, A.M. Ferretti, A. Ponti, J. Appl. Cryst., 2011, 44, 454.

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