Strain-free Oxide Nanopowders, Facts and ex-Oxalate MgO Case

Nathalie Audebrand[a], Christine Bourgel[b], Daniel Louër[b], [a]*Laboratoire de Chimie du Solide et Inorganique Moléculaire (UMR 6511 CNRS), Université de Rennes.* [b]*CNRS, Rennes, France.* E-mail: Nathalie.Audebrand@univ-rennes1.fr

The microstructural characterization of nanocrystalline materials is of particular importance in the study of chemical fragmentation processes and oxides prepared from solution routes. Only a few examples of strain-free (i.e. with negligible microdistortion) oxides have been reported. Their preparation is often not trivial, since the chemical nature of the precursor used and the experimental conditions can influence the microstructural properties. Representative examples of strain-free oxides are ZnO [1], CeO_2 [2] and Y_2O_3 [3]. A new example, i.e. nanocrystalline MgO obtained from the thermal decomposition of the oxalate precursor is investigated in detail. The study is based on line broadening analysis carried out with the Voigt/Langford integral breadth and Fourier methods combined with the pattern decomposition technique. The whole pattern refinement method is also applied. A good agreement between the results obtained from the varied approaches is found. Ex-oxalate MgO is strain free. The crystallites are, on average, isotropic with sizes increasing from 130 Å to 640 Å in the annealing temperature range 500-1200°C and crystallite growth varies exponentially. The results obtained from the different methods are discussed and are also compared to those observed with MEB and BET techniques.

[1] Louër D., Auffrédic J.P., Langford J.I., Ciosmak D., Niepce J.C., *J. Appl. Cryst*., 1983, **16**, 183. [2] Audebrand N., Auffrédic J.P., Louër D., *Chem. Mater*., 2000, **12**, 1791. [3] Louër D., Bataille T., Roisnel T., Rodriguez-Carvajal J., *Powder Diffr*., 2002, **17**, 262.

Keywords: line profile analysis, microstructure, nanoparticles