Synthesis by the polyol process of oxide-ion conductor $La_2Mo_2O_9$: incidence on conduction properties and on reducibility.

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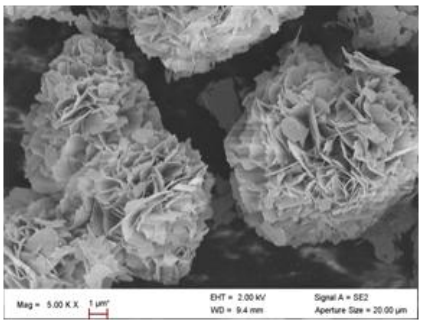
The polyol process was used to prepare nanocrystallized powders of oxide ion conductor $La_2Mo_2O_9$ in order to compare their properties to those of powders synthesized by solid state reaction [1]. Indeed, oxidized ($La_2Mo_2O_9$) and reduced ($La_2Mo_2O_{7-y}$) forms are currently considered as potential electrolyte and electrode materials for single-chamber and double-chamber solid oxide fuel cells, respectively.
The effects of various parameters (reflux time, metal concentration, solvent, hydrolysis rate, hydroxide ions concentration, surfactants, microwave assistance, thermal treatment) on the morphology of the particles and purity of the powder were tested [2]. In particular, after a heat treatment at low temperature (550°C), desert-roses like particles were obtained, with diethylene glycol as solvent, by agglomeration of very thin polycrystalline platelets built up from crystallites of a few tens of nanometers size. On another hand, agglomerated spherical particles have been obtained using ethylene glycol as solvent in the presence of urea. The addition of DDAB surfactant enables a doubling of the specific surface area comparatively to samples without surfactant, from 16 to 30 $m^2.g^{-1}$. Attempts were also made to obtain thin films by spin-coating.

Impedance spectroscopy diagrams were recorded on pellets presenting closed porosity (relative density greater than 92%), sintered without the help of a milling step. Conductivity measurements showed that, depending on the synthesis parameters, the grain conductivity can be slightly increased.

The study of the reducibility, under diluted H_2, of powders resulting from the synthesis by the polyol process, shows that the oxygen losses are faster and larger than with powders synthesized by solid state reaction. Reoxidation of amorphous reduced powders is also faster and occurs at much lower temperature in the case of powders obtained by the polyol route [3].



SEM image of particles obtained with diethylene glycol.

[1] H. Sellemi, S. Coste, A. Ben Ali, R. Retoux, L.S. Smiri, P. Lacorre, *Ceram. Int.* 39 (2013) 8853-8859.
[2] H. Sellemi, S. Coste, M. Barré, R. Retoux, A. Ben Ali, P. Lacorre, *J. Alloys Compd.* 653 (2015) 422-433.
[3] G. Buvat, H. Sellemi, U.K. Ravella, M. Barré, S. Coste, G. Corbel, P. Lacorre, *Inorg. Chem.* 55 (2016), 2522-2533.