

## **YSZ freestanding films from hybrid polymer-oxide composites by the sol-gel process: influence of polymer features on ceramic microstructure**

*Petra Egger, Gian Domenico Sorarù, Riccardo Ceccato and Sandra Dirè*

Dipartimento di Ingegneria dei Materiali e Tecnologie Industriali, Università di Trento, Trento. Italy

### Contact-address:

Petra Egger, Dipartimento di Ingegneria dei Materiali e Tecnologie Industriali, Università di Trento, via Mesiano 77, 38050 Trento;

E-mail: [eggerp@ing.unitn.it](mailto:eggerp@ing.unitn.it)

Hybrid polymer-yttria-zirconia gels have been used to prepare freestanding, dense and crack free cubic yttria-stabilized zirconia (YSZ) films. Depending on the final ceramic properties, these materials find application as components in solid oxide fuel cells (SOFC's). Different organic and bioorganic macromolecules such as albumin, starch, sucrose, dextran, carboxymethylcellulose, polyvinyl pyrrolidone and polyvinyl alcohol, have been used to prepare polymer-oxide nanocomposites. The reason for adding a polymer to a sol-gel derived inorganic network stays in avoiding cracks formation during the pyrolysis process, which converts the preceramic into the ceramic material. Polymers behave as stress relaxing agents and allow obtaining dense and crack free final ceramics.

The differences in polymer chemical structure and solubility impose variable synthesis procedures, and limit the availability of suitable yttria precursors. YSZ films have been obtained from hybrid polymer-containing composites by thermal treatment under different atmospheres. Here we present a study concerning the influence of different polymers on the microstructural properties of the ceramic films. XRD, SEM, TGA, N<sub>2</sub> sorption and density measurements have been used to characterize the polymer-to-ceramic transformation and the final ceramic materials.