Printing of NiO-YSZ nanocomposites: from continuous synthesis to inkjet deposition - DTU Orbit (11/02/2019)

**Printing of NiO-YSZ nanocomposites: from continuous synthesis to inkjet deposition**

Water-based inks, containing nanometric NiO and YSZ particles in 66/34 vol. % ratio, are produced by colloidal stabilization of a binary dispersion obtained via continuous hydrothermal synthesis at supercritical conditions, i.e. 280 bar and 400 °C. The method yields single-crystal particles with diameter ≤ 10 nm for both phases in a single-step process, achieving a highly mixed composite. Two different approaches are applied to formulate inks printable with piezoelectric printheads, i.e. an electrostatic and an electrosteric stabilization path. The use of an electrosteric dispersant results in colloids with superior stability > 200 days, more uniform thin films and finely nanostructured porous cermet films with thickness below 500 nm, after reducing NiO to Ni. Particles coarsening to 50-150 nm is obtained at 1000 °C, accompanied by a shrinkage of ca. 43 % in thickness without the formation of cracks or delamination of the zirconia substrates.

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