

## **Fabrication of ceramic hollow beads by phase inversion method**

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In this study ceramic hollow beads with a diameter of around 1-2mm but a uniform size were prepared by a phase inversion method and subsequent thermal treatment. During phase inversion a homogeneous polymer solution is transformed into a two-phase system in which a solidified polymer phase forms a porous structure, while a liquid phase, poor in polymer, fills the pores.

In the current study a desired amount of ceramic powder e.g aluminium oxide ( $\text{Al}_2\text{O}_3$ ), yttria-stabilized zirconia (8-YSZ) is added to a polymer solution, which consists of polymer polyethersulfone (PESf) in N-methyl-2-pyrrolidone (NMP). The ceramic/polymer/ solvent system can be seen as a suspension. Once immersed into a non-solvent (water) for the polymer which is miscible with the solvent, solvent/non solvent exchange takes place, leading to the precipitation of the polymer phase. Ceramic particles are immobilized by the polymer once precipitation takes place. Thermal treatment removes the polymer, forming inorganic beads of porous ceramic structure<sup>1</sup>. The features of the as formed porous macrostructure of the beads can be largely determined by adjusting parameters of the phase inversion process.

The samples were characterized using scanning electron microscope (SEM), mercury intrusion porosimetry and thermogravimetric analysis<sup>1-6</sup>. The as formed ceramic beads show high degree of porosity and a hierarchical microstructure<sup>7-8</sup>. This microstructure is maintained even after thermal treatment at elevated temperatures ( $>1200^\circ\text{C}$ ). Critical factors affecting the structure and the properties of the ceramic beads such as viscosity of the slurry, ceramic powder/polymer ratio and sintering temperature were studied.

### **References**

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