

PhD thesis, code: glass particles

3D printing and Injection Moulding of Multicomponent Glasses

Glasses are an important class of materials in scientific research, industry and society. Their unmatched optical transparency in combination with their chemical and thermal resistance make glasses ideal for the use in chemical synthesis, optics and photonics or medical applications. However, glasses and especially high purity glasses like fused silica glass are notoriously difficult to structure: requiring high-temperature melting or hazardous etching processes.

We have recently developed a new method to fabricate high quality fused silica glass using silica nanocomposites (Kotz et al., *Advanced Materials*, 2016). Hereby glass nanocomposites are structured like a polymer and then turned into high-quality fused silica glass using thermal debinding and sintering. Using this technology it is for the first time possible to structure fused silica glass using 3D printing but also by high-throughput replication technologies like roll-to-roll replication (Kotz et al., *Nature*, 2017; Kotz et al. *Advanced Materials*, 2018).

This work aims to expand these processes to multicomponent glasses (e.g. optical glasses) and enable further industrially relevant processing techniques for glasses. In this work you will:

- synthesize and test novel multicomponent glass nanoparticles and precursors
- establish high-temperature protocols for thermal debinding and sintering of multicomponent glasses
- establish novel structuring technologies for multicomponent glasses e.g. 3D printing, injection molding and casting
- generate coatings of these novel glass materials on technical substrates (like metals, glasses and ceramics)
- test the properties of these glasses in different applications e.g. flame protection, super-repellency, optics and membranes.

Field of study: chemistry, material science, process engineering

Professional skills: You should have an excellent academic track record, experience in practical synthesis with a focus on organic and polymer chemistry. Basic knowledge on the fabrication of composites and sol-gel chemistry are beneficial. Excellent knowledge of English language are mandatory.

Personal skills: You should be interested in working in an interdisciplinary team between engineering and material science and keen on pursuing your own ideas and expanding your knowledge by extensive reading.

For further information please contact:

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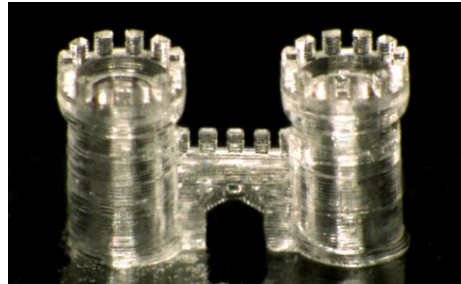
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