



Fabrication and characterization of water glass-based hierarchical structured composites

Sodium silicate, so called water glass, has been widely used in various industries due to its excellent properties and cost-efficient. It offers many possibilities of manufacture of moldings, e.g. forming foams during sintering by the evaporation of water, without the addition of further foaming additives. Further, they are expected to be biocompatible, due to their composition similar to the widely-used bioglasses from the Si-Na-Ca-P system, such as Bioglass®. Additionally, it was reported that water glass act as catalyst for apatite nucleation. The water glass-based hierarchical structured composite could be a promising candidate as scaffold for bone repair due to low cost and simple preparation process. We therefore aim at developing and optimizing a cost-effective and simple process for the production of three-dimensional, highly porous and mechanically resilient water glass-moldings with controlled interconnected network using a cheap source such as water glass. The project includes:

Fabrication:

- microwave heating
- freeze casting
- additive manufacturing

Characterization:

- microstructure (light and electron microscopy, microtomography)
- crystallinity (X-ray diffraction (XRD))
- chemical composition (fluorescence spectroscopy)

Mechanical properties:

- compression tests
- bending tests
- nanoindentation).

Bioactivity tests with simulated body fluids

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Forschungsthemen

Hierarchical structured composites
Microwave heating
Additive manufacturing
Gel-like material

Materialien

Water glass
Calcium phosphate