Investigation of injection molded short-fiber reinforced CMCs

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Ceramic Injection Molding (CIM) has already found its way into large-scale industrial manufacturing. As further improvement oxide fibers might be embedded into the ceramic matrix to increase mechanical properties especially at elevated temperatures.

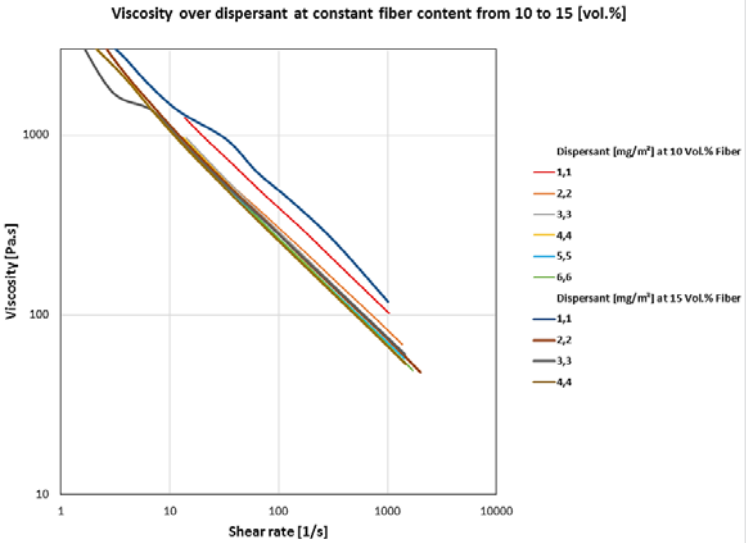
Objectives

- Development of feedstocks containing up to 50Vol% powders + fibers
- Specialities of injection molding process for CMC
- Investigation of samples in green + sintered state

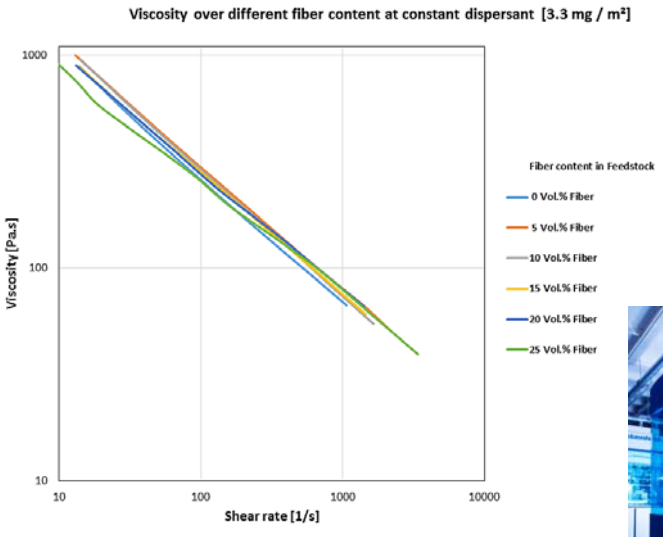
Materials

- Chopped Al_2O_3 fibers (Nextel 610)
- Al_2O_3 powder (TM-DAR), D50 ≤ 200nm
- Binder: Polyethylen, paraffin wax, stearic acid, dispersants

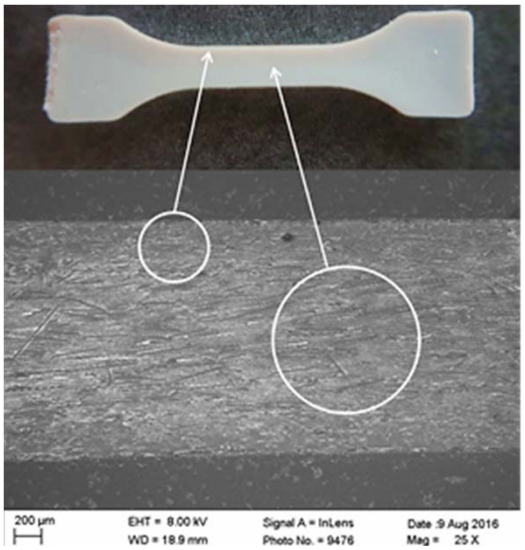
Results



Above: Viscosity vs dispersant concentration. Best fluidic properties could be reached with dispersant concentrations > 2.2 mg/m².



Above: Viscosity vs fiber content. Flowability depends less strongly on fiber content as expected.



Right: Tensile specimen made of CMC feedstock (green body, above). SEM picture of the same sample showing the high degree of fibre orientation near to the surface (high shear area) and a less degree of orientation in the bulk, i.e. in the low shear area (bottom).

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