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Simulation of DPF Media, Soot Deposition and Pressure Drop Evolution



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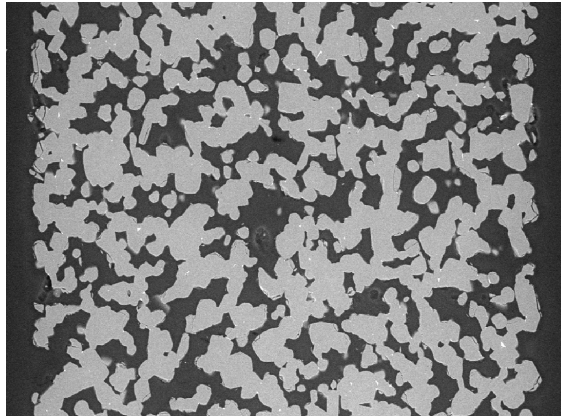
Andreas Wiegmann

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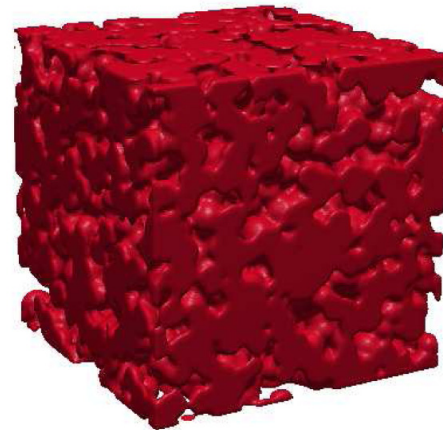
- Microstructure Modeling
- Simulation of Soot Particle Deposition and Soot Layer Build-Up
- Comparison of Soot Filtration Simulation and Measurement

Microstructure Modeling

- Given 2D polished micrograph sections, measured porosity and measured permeability for a microstructured material
- Analyse 2D images and generate 3D models



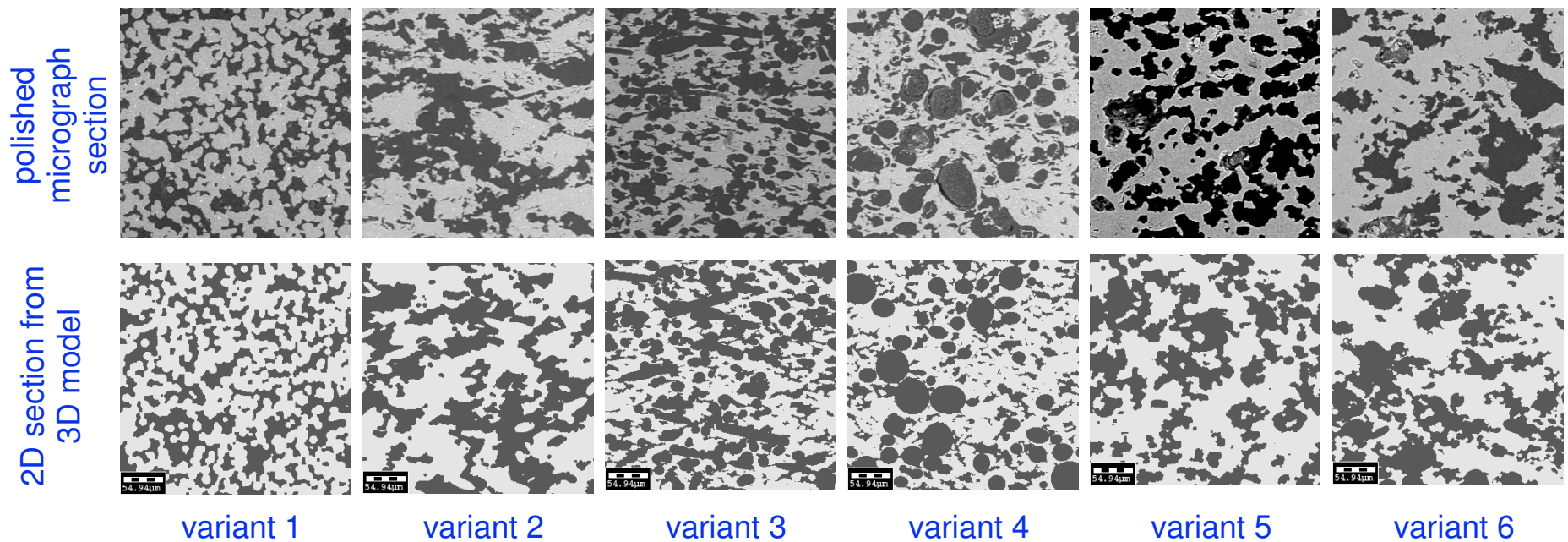
polished micrograph section
of a SiC ceramic
(horizontally approx. 600 μm)



3D microstructure model
generated with GeoDict

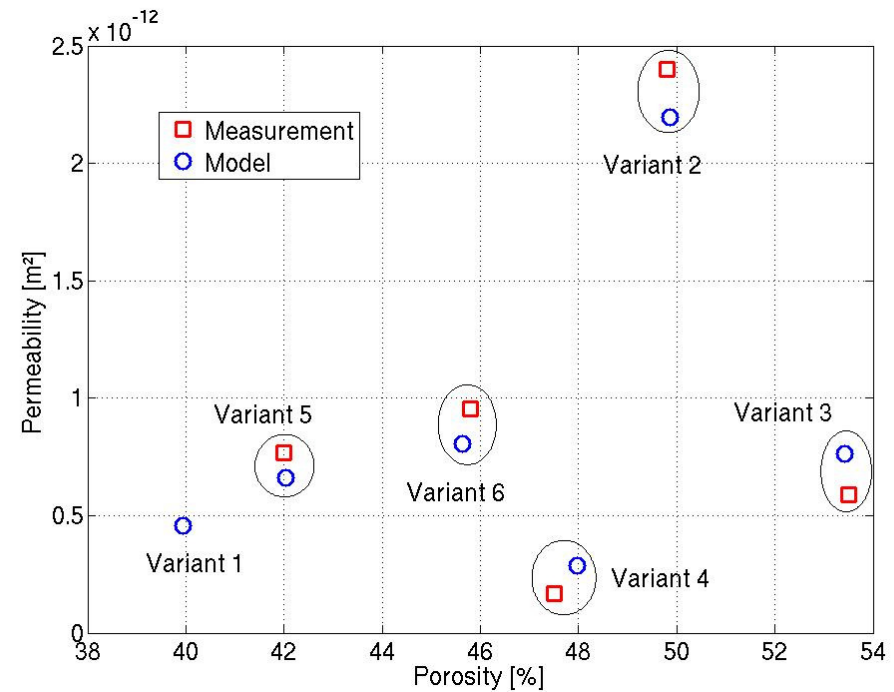
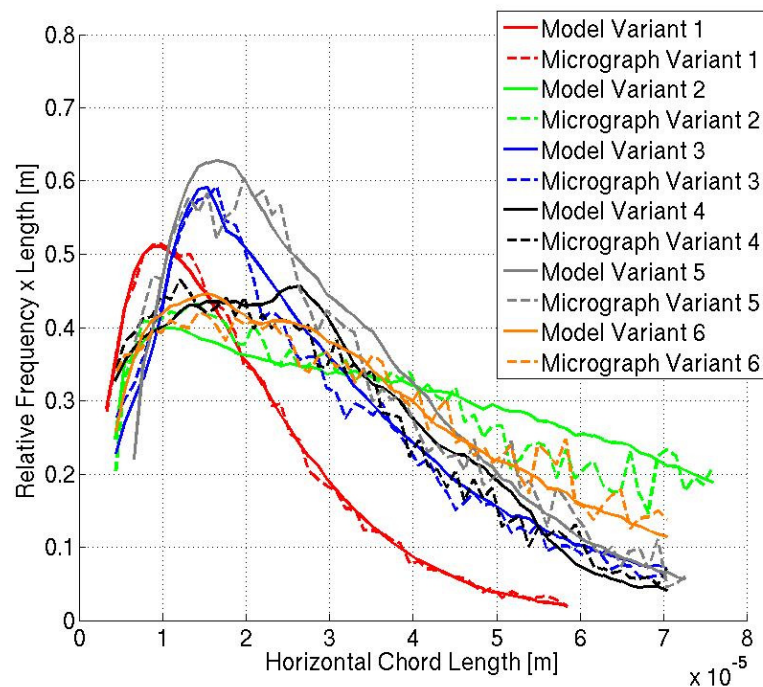
Microstructure Modeling

- Various ceramic variants have been reconstructed and validated



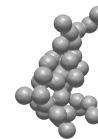
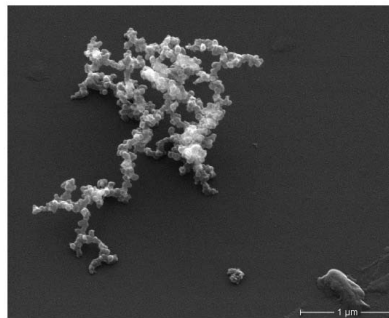
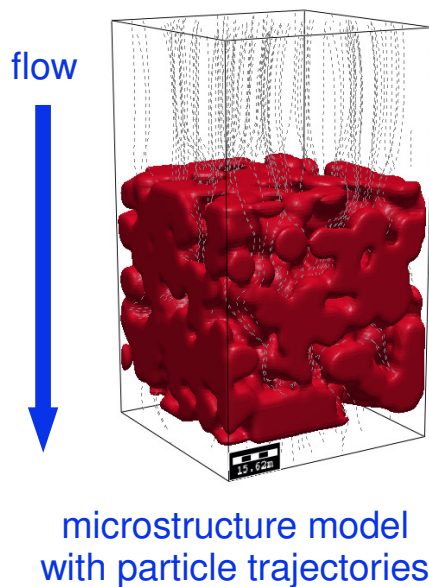
Microstructure Modeling

- Geometric construction by comparing chord length distributions
- Experimental validation by comparing permeability

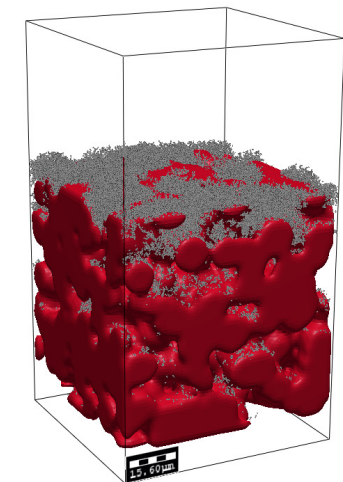


Simulation of Soot Particle Deposition and Soot Layer Build-Up

- Computation of flow and particle trajectories
- Soot agglomerate shapes are modeled in detail and affect the soot layer build-up decisively



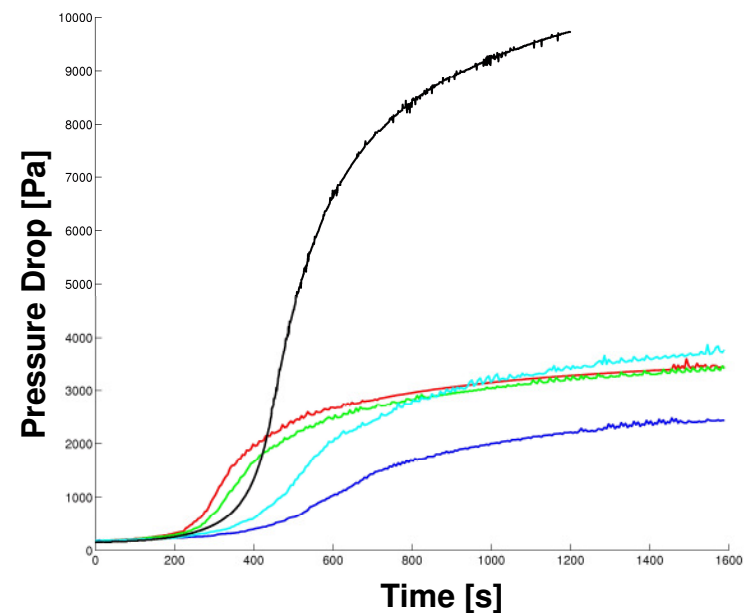
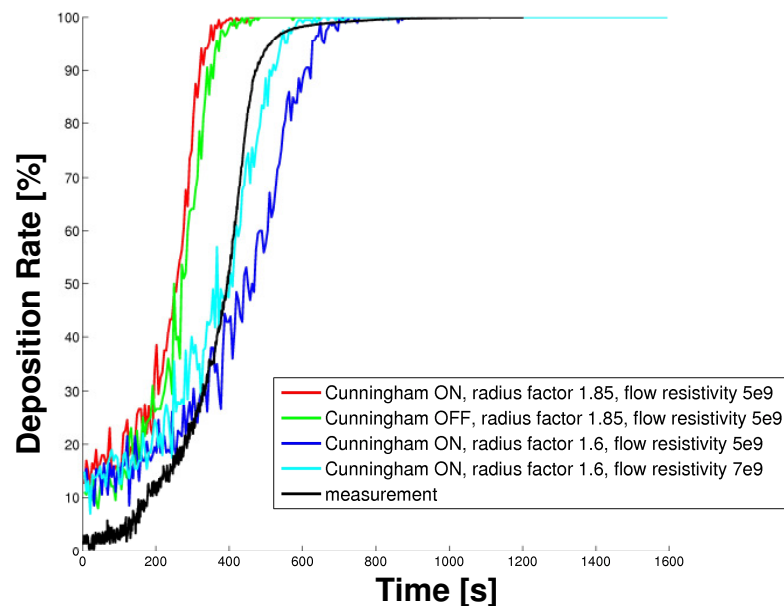
SEM image of soot agglomerate (left)
and simulation model (right)



microstructure model
with deposited soot

Comparison of Soot Filtration Simulation and Measurement

- Soot filtration experiments with artificial well-defined microstructure (microsieve) for validation of simulations
- Qualitative agreement of computed and measured deposition rate and pressure drop evolution
- Quantitative agreement is current research



**thank you for
your kind attention**