

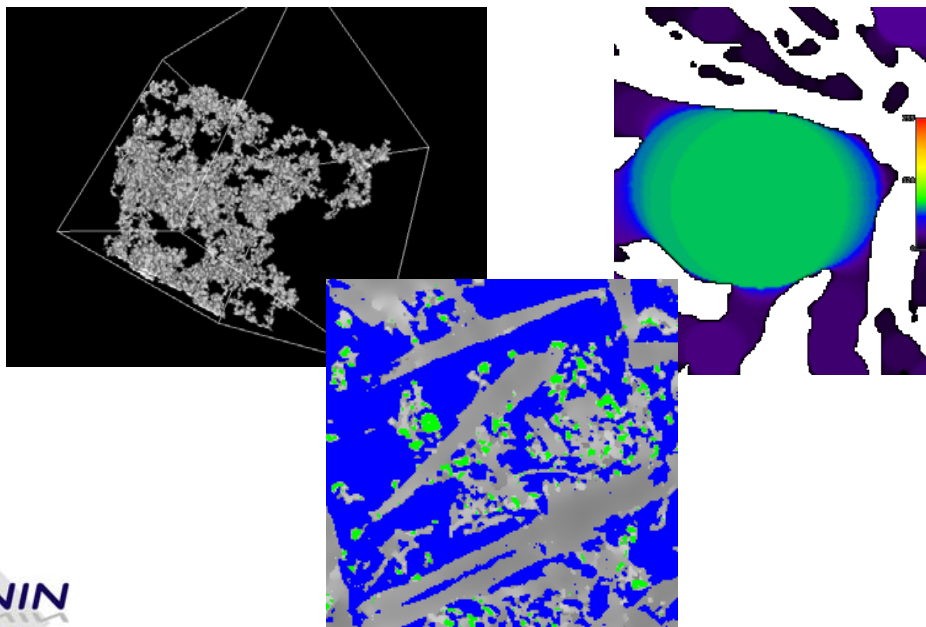
Structure-Property Functional Relationships in Porous Media

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NNIN Facility utilized: Characterization Facility

DESCRIPTION OF WORK

- ◆ Visualization and characterization of 3D structure of porous materials using X-ray computed tomography
- ◆ Transport property estimation using random walk simulation in actual 3D structures
- ◆ Morphological changes and degradation kinetics of biopolymers



MAJOR OBSERVATIONS

- ◆ 3D structural characteristics of porous materials can be discerned non-intrusively using X-ray computed tomography and sophisticated image analysis and numerical simulation methods
- ◆ Structural and diffusional anisotropy and their dependence on individual conductances of the multi-phase medium has been clearly shown for the first time; As the conductance of one of the medium increases, initially anisotropic material begins to behave more like isotropic material with similar properties in all orthogonal directions
- ◆ Intrinsic transport characteristics of the individual phases, difficult to determine experimentally, has been elucidated using actual 3D structures and numerical simulations

Publications

- ◆ J. Hyv"aluoma, T. Turpeinen, P. Raiskinm"aki, A. J"asberg, A. Koponen, M. Kataja, and J. Timonen, S. Ramaswamy, "Intrusion of non-wetting liquid in paper", Physical Review E 75, 036301 (2007)
- ◆ Defrenne, Y., Zhdankin, V., Takagaki, S., Ramaswamy, S., Lavrykov, S. and Ramarao, B.V. Multiscale moisture transport in paper: Impact of pore and fiber tortuosity and anisotropy, Proc. Of the Fundamental Research Conference, Cambridge, U.K. (2009)