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POROUS MEDIA INVESTIGATION USING DUAL NETWORK MODELS

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Extracting structural information, such as pore networks, from tomographic images is a powerful tool for the study of porous materials. Pore network models are used for predicting different physical properties such as permeability and tortuosity, and simulating chemical process such as reactive transport. Due to its inherent simplifications, pore network modelling requires far less computation cost and time as compared to other pore-scale modelling approaches like lattice Boltzmann and finite volume method allowing researchers to investigate larger volume of porous materials[1,2]. Consequently, they are being increasingly used to study multiphysics in various devices where the porous structure plays a critical role in performance[3], but true pore-scale modeling is computationally infeasible.
In traditional pore network modelling applications, the solid phase network is not usually considered since the only the fluid phase is of interest. In electrochemical devices, however, electron and heat transport through the solid phase of the electrode are equally important. In this work, we report on the concept of extracting dual network models from tomographic images, that includes information for both solid and pore phases and interlinking of these phases with each other. These dual network models provide a new avenue for understanding many critical chemical process like reaction-diffusion in catalysts as well as batteries charging and discharging kinetics in porous electrodes, both of which require understanding the solid phase transport. The presented algorithm is based on an algorithm recently published by our group[1], and produces output that is compatible with the open-source modeling package OpenPNM[4]

References:
1. Gostick, J. T. Versatile and efficient pore network extraction method usingmarker-based watershed segmentation. 1 Phys. Rev. E 3300, 1–11 (2017).
2. Xiong, Q., Baychev, T. G. & Jivkov, A. P. Review of pore network modelling of porous media : Experimental characterisations , network constructions and applications to reactive transport. J. Contam. Hydrol. 192, 101–117 (2016).
3. Aghighi, M., Hoeh, M. A., Lehnert, W., Merle, G. & Gostick, J. Simulation of a Full Fuel Cell Membrane Electrode Assembly Using Pore Network Modeling. J. Electrochem. Soc. 163, F384–F392 (2016).
4. Gostick, J. et al. OpenPNM: A Pore Network Modeling Package. Comput. Sci. Eng. 18, 60–74 (2016).

References

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