

Genetic algorithm-based pore network extraction from micro-computed tomography images

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A genetic-based pore network extraction method from micro-computed tomography (micro-CT) images is proposed in this paper. Several variables such as the number, radius and location of pores, the coordination number, as well as the radius and length of the throats are used herein as the optimization parameters. Two approaches to generate the pore network structure are presented. Unlike previous algorithms, the presented approaches are directly based on minimizing the error between the extracted network and the real porous medium. This leads to the generation of more accurate results while reducing required computational memories. Two different objective functions are used in building the network. In the first approach, only the difference between the real micro-CT images of the porous medium and the sliced images from the generated network is selected as the objective function which is minimized via a genetic algorithm (GA). In order to further improve the structure and behavior of the generated network, making it more representative of the real porous medium, a second optimization has been used in which the contrast between the experimental and the predicted values of the network permeability is minimized via GA. We present two case studies for two different complex geological porous media, Clashach sandstone and Indiana limestone. We compare porosity and permeability predicted by the GA generated networks with experimental values and find an excellent match.

Biography

Ali N. Ebrahimi has completed his Master study at the age of 23 years from Sharif University of Technology, Tehran, Iran and now is doing Ph.D. study in ETH University, Zurich, Switzerland about modeling microbial life in porous media using pore network model. He has published more than 5 papers in reputed journals and 11 conference papers.

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