Contribution ID: **818** Type: **Poster (+) Presentation**

Efficient Numerical Design of Porous Materials With Target Properties and Microstructure

Thursday, 3 June 2021 14:40 (1 hour)

Despite recent advances in synthesis and manufacturing of porous materials and devices, producing porous structures with targeted properties is still an expensive, trial-and-error procedure. A powerful way to accelerate this process and to guide manufacturing is to use numerical design of porous media. Current numerical porous media design methodologies typically include a random microstructure generator nested within an optimization routine. At each iteration, the optimization algorithm compares properties of the microstructure such as permeability, porosity, and pore size distribution with their desired target values and modifies the inputs to the generator accordingly. A considerable drawback of this approach is computational cost, which is mainly due to the time needed to generate a completely new microstructure and to compute the corresponding properties at each iteration. To address this problem, we propose the adjustable level-cut filtered Poisson field (ALCPF) method, a new approach based on the level-cut Poisson field theory. First, several initial domains are generated based on a set of filtered Poisson field parameters. Then, rather than generating a completely new field, the optimization algorithm takes a weighted geometric average of the initial domains to produce an updated random field. Material properties of the generated sample are then computed using a fast pore topology method (PTM). The weights are adjusted until an optimal domain is found. With up to threefold reduction in computational time, this method successfully matches target pore size distribution, pore size gradient and permeability at a wide range of porosities.

Time Block Preference

Time Block B (14:00-17:00 CET)

References

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