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A level set method for solid-liquid interface tracking in texturally equilibrated pore networks[1] SOHEIL GHANBARZADEH, MARC HESSE, MASA PRODANOVIC, The University of Texas at Austin — The properties of some porous media are determined by their evolution towards textural equilibrium. Melt drainage from temperate glacier ice and the accumulation of hydrocarbons beneath rock salt are two examples in natural systems. In these materials, pore geometry evolves to minimize the solid-liquid interfacial energy while maintaining dihedral angle, θ, at solid-liquid contact lines. In this work we present the first computations of 3-D texturally equilibrated pore networks using a novel level set method. Interfacial energy minimization is achieved by evolving interface under surface diffusion to constant mean curvature surface. The porosity and dihedral angle constraints are added to the formulation using virtual velocity terms. A domain decomposition scheme is devised to restrict the computational domain and the coupling between the interfaces is achieved on the original computational domain. For the last 30 years, explicit representation of the interfaces limited the computations to highly idealized geometries. The presented model overcomes these limitations and opens the door to the exploration of the physics of these materials in realistic systems. For example, our results show that the fully wetted grain boundaries exist even for $\theta>0$ which reconciles the theory with experimental observations.

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