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Percolation Through Voids Around Structurally Disordered Sand Grains NICHOLAS MCGUIGAN, DONALD PRIOUR, Youngstown State Univ — Fluid flow or charge transport through porous materials takes place within voids around impermeable grains. With increasing density of grains, fluid flow diminishes, ultimately ceasing at the percolation transition separating configurations macroscopically navigable; and those which block fluid flow in the bulk limit. Theoretical studies of void networks have generally been confined to monodispersed systems of identical particles, with no calculations of percolation thresholds for geometrically diverse grains. In addition to positional and orientational disorder, we incorporate structural disorder by imposing random variations in the geometries and sizes of grains, akin to realistic porous materials. We consider cubes distorted into rectangular solids with random proportions. More comprehensibly, we also examine configurations of structurally disordered tetrahedra and parallelepipeds with both random perturbations in edge lengths and dihedral angles. Reflecting the fact that grains in practice are irregular polyhedral with various numbers of faces, we also implement structural disorder by using Voronoi tessellation to carve out irregularly shaped grains. Intuitively, this approach mimics the formation of grains in nature from fractured larger objects.

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