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Percolation through Voids around Impenetrating Toroidal Inclusions PAYTON LINTON, ALEXANDRA BALLOW, DONALD PRIOUR, Youngstown State University — Porous materials made up of impermeable grains constrain fluid flow to voids around the impenetrable inclusions. A percolation transition marks the boundary between densities of grains permitting bulk transport and concentrations blocking traversal on macroscopic scales. With dynamical infiltration of void spaces using virtual tracer particles, we treat inclusion geometries exactly. We calculate the critical number density per volume ρc for toroidal inclusions. The critical number is well-known for axially symmetric shapes and faceted solids, but has yet to be calculated for any non-convex particles. We consider aligned and randomly oriented inclusions, for torii with both circular and square cross-sections. The excluded volumes tend to finite values for both randomly oriented and aligned torii. In a definitive difference from convex solids, aligned tori are less permeable than their randomly oriented counterparts in certain situations such as when torii are narrow.

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