Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

A Dynamically Based Study of Percolation through Spaces between Polyhedral Grains DONALD PRIOUR, Youngstown State University — Many porous materials in nature are made up of grains in the form of non-spherical crystallites. Depending on the density of the grains, such systems may admit the flow of fluid through the spaces between the grains on a macroscopic scale (percolation for sufficiently sparsely spaced grains) or prevent fluid flow (percolation is blocked if the grain concentration is high enough that voids between grains are not contiguous). To provide a more realistic treatment of percolation through granular media, we examine systems comprised of randomly placed angular impermeable inclusions (e.g. disks, tetrahedrons, cubes, and octahedrons), and we give a rigorous continuum treatment to the geometry of the grains and the spaces between them. To extrapolate to the bulk limit in the context of a finite-size scaling analysis, we examine multiple systems of different sizes, where disorder averaging mitigates statistical fluctuations unrelated to bulk properties. An order parameter based on root mean square (RMS) excursion of dynamical trajectories is calculated in the context of a large-scale Monte Carlo simulation and used to evaluate the critical concentration ρ_c of grains. In addition, critical exponents such as ν for the correlation length ξ are determined.

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Date submitted: 09 Nov 2012 Electronic form version 1.4