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Effect of Size Polydispersity on Diffusion Behaviors of Traces in Random Obstacle Matrices HYUN WOO CHO, BONG JUNE SUNG, Department of Chemistry, Sogang University, Seoul 121-742, Republic of Korea, ARUN YETHIRAJ, Theoretical Chemistry Institute and Department of Chemistry, University of Wisconsin, Madison, Wisconsin 53706, USA — Diffusion behavior on random obstacle matrices has been studied extensively for several decades to explain dynamic behaviors in disordered systems, such as dynamic arrest in colloidal glass phase and anomalous diffusion in crowded biological systems. We present the effect of size polydispersity of the obstacles on diffusion behavior in two-dimensional random obstacle matrices. We generate the random matrices by randomly locating non-overlapping hard disks in two-dimensional space, and consider the diffusion behavior of the tracers. We show that the diffusion behavior is sensitive to the size polydispersity of the obstacles even though their average sizes are the same. In addition, we locate the percolation threshold of void space, and find that diffusion constant D follows scaling relation $D \sim (\varphi_c - \varphi)^{\mu-\beta}$ regardless of the size polydispersity, where φ and φ_c is the area fraction of the obstacles and its value at percolation threshold, respectively. The value of the dynamic scaling constant μ is, however, not universal. We will also discuss briefly non-universal dynamic scaling exponents of two-dimensional random obstacle matrices.

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