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Percolation velocity dependence on local concentration in bidisperse granular flows[1] RYAN P. JONES, HONGYI XIAO, ZHEKAI DENG, PAUL B. UMBANHOWAR, RICHARD M. LUEPTOW, Northwestern University — The percolation velocity, u_p, of granular material in size or density bidisperse mixtures depends on the local concentration, particle size ratio, particle density ratio, and shear rate, $\dot{\gamma}$. Discrete element method computational results were obtained for bounded heap flows with size ratios between 1 and 3 and for density ratios between 1 and 4. The results indicate that small particles percolate downward faster when surrounded by large particles than large particles percolate upward when surrounded by small particles, as was recently observed in shear-box experiments. Likewise, heavy particles percolate downward faster when surrounded by light particles than light particles percolate upward when surrounded by heavy particles. The dependence of $u_p/\dot{\gamma}$ on local concentration results in larger percolation flux magnitudes at high concentrations of large (or light) particles compared to high concentrations of small (or heavy) particles, while local volumetric flux is conserved. The dependence of $u_p/\dot{\gamma}$ on local concentration can be incorporated into a continuum model, but the impact on global segregation patterns is usually minimal.

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Ryan P. Jones
Northwestern University

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