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Phase Transitions of Bidisperse Granular Mixtures in Rotating Tumblers GABRIEL JUAREZ, RICHARD M. LUEPTOW, JULIO M. OTTINO, Northwestern University — Various aspects of axial banding of size-varying bidisperse granular mixtures in cylindrical tumblers has been documented repeatedly over a decade or so, but the dependence of band formation on the relative concentration of particles or rotation rate has not been thoroughly examined. Phase transitions analogous to nucleation and spinodal decomposition appear to occur as the relative concentration of small and large particles and the rotation rate (granular temperature) of the tumbler are varied. Phase separation similar to nucleation occurs near the endwalls for very low or high concentrations of small particles in which relatively few axial bands form and grow but do not coarsen. Phase separation similar to spinodal decomposition occurs for moderate relative particle concentrations in which bands form along the entire length of the tumbler and eventually merge, leading to coarsening of the segregation pattern. A phase diagram with a miscibility gap can be constructed from the space-time plots.

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