

Role of Hopper Angle on the Jamming of Granular Material under Vertical Vibration

Panupat Chaiworn¹, Tawanchay Tungkanakorn² and Seri Pansang³

^{1,2} Department of Physics, Faculty of Science and Technology, Chiang Mai Rajabhat University, Thailand

³ Department of Computing, Faculty of Science and Technology, Chiang Mai Rajabhat University

E-mail: panupat_cha@g.cmru.ac.th

Abstract

This study aims to experimentally investigate the role of wedge-shape hopper angle on jamming of 2D granular materials under vertical vibration. The cylindrical particles used in the experiment were made from hardwood with a smooth and dry surface. There were 350 particles which were randomly placed inside the hopper whose angles were 10 – 50 degrees and whose opening was 2 and 3 times larger than the granular material's diameter. The granular material freely flowed and vertically vibrated with 5 values of dimensionless vibration acceleration ranged from 0.011g – 0.307g. The result illustrated that the higher the hopper opening, the higher, the hopper angle and the dimensionless vibration accelerations gave the lesser jamming ratios, jamming probability and the lesser the hopper emptying time became, and this lead to the higher mass flow rate.

Keywords: Granular materials, Jamming, Hopper, Vertical vibration