

The Thermal Conductivity Theory of Non-uniform Granular Flow and the Mechanism Analysis

ZHANG Duan-Ming^{1,2} LEI Ya-Jie,¹ YU Bo-Ming,¹ and PAN Gui-Jun¹

¹ Department of Physics, Huazhong University of Science & Technology, Wuhan 430074, China

² State Key Laboratory of Laser Technology, Huazhong University of Science & Technology, Wuhan 430074, China

(Received: 2003-1-20; Revised:)

Abstract: According to the fractal characteristics appearing in non-uniform granular system, we found the fractal model to study the effective thermal conductivity in the mixed system. Considering the quasi-equilibrium, we bring forward the fractal velocity probability distribution function. The equipartition of energy is employed to the non-uniform granular system, and the granular temperature is derived. We investigate the thermal conductivity in granular flow due to the movement of the particles, namely the heat transfer induced by the streaming mode only. The thermal conductivity in the mixed system changes with the fractal parameters such as the solid fraction v , structural character parameter η , and fractal dimension D of size distribution. These parameters depict the characteristics of the thermal conductivity in the actual complex granular system. Comparing our conclusion with the correlative experimental data and the theoretical conclusion of binary mixture of granular materials, the results can qualitatively confirm the generality of our prediction on the granular system.

PACS: 44.10.+i, 61.43.Hv

Key words: fractal granular, non-uniform granular flow, velocity distribution function, effective thermal conductivity

[\[Full text: PDF\]](#)

Close