Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Equation of state and jamming density for equivalent bi-, tri- and polydisperse, smooth, elastic sphere systems[1] VITALIY OGARKO, STEFAN LUDING, University of Twente — We study binary, ternary and polydisperse mixtures of hard particle fuids as models for granular matter, colloids and other soft matter. Size ratios between 1 and 100 are studied for different size distributions. Simulation results are compared with previously found analytical equations of state by looking at the compressibility factor, Z, and agreement is found with much better than 1% deviation in the fluid regime. A slightly improved empirical correction to Z is proposed. When the density is further increased, the behavior of Z changes and there is a close relationship between many-component mixtures and their two- and three-component equivalents (where our contribution is to define the term "equivalent"). We determine the size ratios for which the liquid-solid transition exhibits crystalline, amorphous or mixed system structure. Near the jamming density, Z is independent of the size distribution and follows a -1 power law as function of the difference from the jamming density. In this limit, Z depends only on one free parameter, the jamming density itself, as reported for several different size distributions with a wide range of widths.

[1]This research is supported by the Dutch Technology Foundation STW, which is the applied science division of NWO, and the Technology Programme of the Ministry of Economic Affairs, project Nr. STW-MUST 10120.

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Date submitted: 25 Nov 2011 Electronic form version 1.4