DY 22: Granular matter / contact dynamics I

Time: Wednesday 15:45–17:15 Location: H2

DY 22.1 Wed 15:45 H2

Ripples in weakly turbulent flows in an annular channel — •Andreas Wierschem[1], Tobias Edtbauer[1,2], Christopher Groh[2], Christoph Krülle[2], Ingo Rehberg[2], and Nuri Aksel[1] — [1]Technische Mechanik und Strömungsmechanik, Universität Bayreuth, D-95440 Bayreuth — [2]Experimentalphysik V, Universität Bayreuth, D-95440 Bayreuth

One of the most conspicuous examples of pattern formation in nature are the dunes and ripples formed in sand, either by wind or by surface waves and shear flows in water. The environmental flow conditions are usually highly turbulent. In laboratory studies, research has also mainly been focused on the formation of ripples and dunes in fully turbulent flow. Here, we present an experimental study of ripple generation in an annular channel at rather low Reynolds numbers in weakly turbulent flow. We detect the granular motion, the resulting ripples, and characterize the velocity field in the overlying fluid that provokes the ripple formation.

DY 22.2 Wed 16:00 H2

Granular detachment from a moving bulk — •Claas Bierwisch, Torsten Kraft, Michael Moseler, and Hermann Riedel — Fraunhofer-Institut für Werkstoffmechanik, Wöhlerstraße 11, 79108 Freiburg, Germany

Powder discharge under gravity from a moving reservoir into a cavity has been investigated using discrete element simulations. Agglomerate models were used besides spherical grain representations. Granular friction and cohesion have been calibrated within quasi two dimensional reference and validation experiments. While all models were able to predict flow rates for simple geometries they differ strongly when tested in fully three dimensional cavities and in the angles of repose which they form. Coarse graining effects on static and dynamic properties as well as universal scaling properties of velocity fields will be presented furthermore.

DY 22.3 Wed 16:15 H2

In-situ investigation of the structural and electrical properties of nanosized silicon powders — •Ingo Plümel[1,2], Hartmut Wiggers[2], and Axel Lorke[1] — [1]Experimental Physics and CeNIDE, University Duisburg-Essen, Lotharstr. 1, 47057 Duisburg, Germany — [2]Institute of Combustion and Gas Dynamics, University Duisburg-Essen, Lotharstr. 1, 47057 Duisburg, Germany

Nanosized Silicon powders were characterized by determining in-situ the conductivity, impedance, and mechanical compaction while applying a mechanical pressure. In porous systems like powders, the macroscopic electrical properties result from transport mechanisms such as hopping and tunneling between particles as well as from structural properties such as the amount and shape of particle contacts. Thus the density change of the powder during electrical measurements was characterized by means of a laser interferometer. Conductivity measurements as a function of the applied pressure show an exponential dependence for nanosized particles and a power law for microsized particles which can be partly associated to scaling effects for decreasing particle size. A time dependent change in conductivity together with an increase in density was observed while applying a constant pressure suggesting friction limited compaction of the powder. To separate the contributions of the particle cores and particle contacts to the complex conductivity and capacity, impedance spectroscopy was performed. In agreement with the observed compaction of the powder, the spectra show a strong increase of the sample capacity and conductivity as a function of the applied pressure.

DY 22.4 Wed 16:30 H2

Memory effects in wet granular matter — •Christoph Kohlhammer and Michael Schulz — Universität Ulm, Institut für Theoretische Physik, Albert Einstein-Allee 11, 89069 Ulm

We found that a wet granular matter model introduced on the basis of a lattice Monte-Carlo-Model shows memory effects. Those effects are typical for wet granulates as it recenly had been published in different papers dealing experimentally with this subject. The memory effects for example concern the grain density representing the opening angle of the sandpile in dependence of the degree of wetness. So we deal with a non Marcovian model behaving very senitive in the phase transition region. The memory effect allows to define a characteristic time scale.

DY 22.5 Wed 16:45 H2

Fluidization of granular materials wetting by liquid helium — •Kai Huang, Masoud Sohaili, and Stephan Herminghaus — Max-Planck-Institut für Dynamik und Selbstorganisation, Bunsenstr. 10, 37073 Göttingen, Germany

Fluidization of granular media wetting by liquid helium in normal and super-fluid states under vertical vibrations is studied experimentally. The critical acceleration of fluidization is found to depend strongly on the amount of liquid helium condensed on the particles. By comparison of results from normal fluid and superfluid wetting, we explore the effect of viscosity on the dynamics of wet granular materials.

DY 22.6 Wed 17:00 H2

Wet granular matter under pressure and shear forces — •Beatrix Schulz[1] and Michael Schulz[2] — [1]Institut für Physik, Martin-Luther-Universität Halle-Wittenberg — [2]Abteilung für Theoretische Physik, Universität Ulm

Granular matter is a central topic of physical research in complex systems during the last two decades. Although the main stream of investigations is focussed on dry granular materials, the predominant part of real granular matter contains a liquid fraction. The combination of solids, liquids and gas phases leads to several new interactions effects due to the capillar forces. We present a combined numerical and analytical study of wet granular matter under time-dependent pressure and shear forces. Furthermore, we consider in this study reversible and irreversible bridging processes which allow to explain geophysical phenomena observed in wet granular matter.