LINZ CENTER OF MECHATRONICS GMBH

Einladung

zum Vortrag von

Prof. Naveen Reddy, Universität Hasselt (Belgien)

Title: Orientation Dynamics of Dilute Graphene Suspensions: Dichroism and Modeling

Di., 30.01.2018, 13:45 – 15:15 Uhr

Science Park, Raum Nr. S2 046

Graphene sheets are two-dimensional structures made of carbon atoms, which are electrically and thermally conductive and have unique mechanical properties. They have potential applications in many fields, including organic electronics, reinforced and electrically conducting composites and even new types of biological sensors and devices. Promising processing routes involve suspensions of graphene flakes. However, to fully exploit graphene suspensions, control of the microstructure evolution during flow is required. Specifically, a full understanding of the orientation behaviour of the graphene flakes during flow is necessary. In this work, we analyse the orientation dynamics of graphene suspensions in the dilute regime by examining their rheo-optical response. Dichroism is obtained in a Couette flow geometry which allows direct measurement of the average orientation angle (χ) of the particles with respect to the flow direction. Micrometer sized and functionalized graphene flakes were dispersed in a Newtonian mineral oil. The orientation of the system is studied in simple shear flow at steady state and using large amplitude oscillatory shear (LAOS) as a prototype transient flows. In LAOS, the suspensions present an interesting double peaked χ response at large strains during oscillation. To explain flow behaviour of graphene suspensions in simple steady shear and in LAOS, the particles are modelled as oblate spheroids and the suspension orientation dynamics are captured by a single particle Smoluchowski equation. This simple model captures surprisingly well, especially given the strong approximation of particle shape, the suspensions dynamics without the need of additional fitting parameters.

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