

CEA - Saclay 91191 Gif-sur-yvette Cedex
Service de Physique de l'Etat Condensé
SÉMINAIRE

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Yield stress: to flow or not to flow, that is the question

Daniel Bonn

Ecole Normale Supérieure - Laboratoire de Physique Statistique

Yield stress fluids are materials that can behave either as a solid or can flow like a liquid. Perhaps the most ubiquitous problem encountered by scientists and engineers dealing with everyday materials such as food products, powders, cosmetics, concrete... is that the yield stress of a given material has turned out to be very difficult to determine. No single method has been universally accepted as the standard for measuring the yield stress and it is not unusual to find large variations in the results obtained from different methods with the same material, prepared and tested in the same laboratory. These difficulties have resulted in lengthy discussions of whether the concept of the yield stress is useful and how it should be defined and subsequently determined experimentally. I show that most if not all fundamental and engineering problems with yield stress materials are resolved by distinguishing between thixotropic and ideal yield stress materials. The former show time-dependent viscosity effects due to an interaction of the flow with the structure of the materials. If this is taken into account, reproducible measurements are very well possible, and in addition allow to explain shear banding (localization) often encountered for these materials.

Contact : fabien.portier@cea.fr - Tel : +33 1 69 08 72 16/74 75
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