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“Shear thickening suspensions”

ABSTRACT: Concentrated suspensions of hard particles such as cornstarch in water exhibit a number of unusual phenomena, including a uniquely strong, solid-like impact response which allows a person to run or walk on the surface of the fluid (if you haven't seen this, search YouTube for cornstarch). In controlled laboratory experiments, these materials exhibit Discontinuous Shear Thickening, which is measured as a sharp increase in effective viscosity with an increasing shear rate in a steady shear. This is a result of pushing particles together so that they have frictional contacts that connect between particles along force chains that span the system. It has long been assumed that the transient and impact phenomena observed in such suspensions are a consequence of this shear thickening, but the connection has not been shown. I will show that during transient impacts, the force network of solid contacts is more localized and stronger than under steady shear. If this force network propagates to spans the system, then it can support loads like a solid and explain the ability of a person to run on the surface of these fluids. The travel time required for the force network to traverse the system may also explain several other dynamic phenomena observed in these fluids.

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4:15 pm - Room S-122, Sackler Sciences Center