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Suspensions of non-Brownian particles in non-Newtonian fluids[1]

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This talk aims at introducing our current understanding of the rheology of suspensions of non-Brownian particles in non-Newtonian fluids. These complex suspensions can be found in natural settings such as landslides, mudslides, and submarine avalanches as well as industrial applications such as in mining operations, chemical mechanical, conversion of biomass into fuel, the petroleum industry, etc. Biological and smart materials can be complex suspensions, making relevant problems in physiology, biolocomotion, shock absorbers, and beyond. Therefore, there is a compelling need to study the rheological behaviors of these complex suspensions in order to be able to predict their flow dynamics in various situations. The main scientific challenge is to establish a continuum framework and refine it through microstructure investigations. Suspensions may vary on the particle scale from Stokesian behavior to inertial behavior depending on the flow configuration, the type of suspending fluids, etc. We present a tensorial continuum framework based on our recent computational, experimental and theoretical works and discuss how this framework can be used to study the dispersion of solids in industrial processes and geophysical flows.

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