Elasticity and yielding of calcite paste: scaling laws in a dense colloidal suspension

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We address the mechanical characterization of calcite paste as a model system to investigate the relation between microstructure and macroscopic behavior of colloidal suspensions. The ultimate goal is to achieve a control of the elastic and yielding properties of calcite, which will prove valuable in several domains. Rheological measurements have been performed on calcite suspensions for a wide range of particle concentrations [1]. The calcite paste exhibits a typical colloidal gel behavior, with an elastic regime and a clear yield strain above which it enters a plastic regime. The yield strain shows a minimum when increasing the solid concentration, connected to a change of the power law scaling of the storage modulus. In the framework of the classical fractal elasticity model for colloidal suspensions of Shih *et al*. [2], we interpret this behavior as a switch with the concentration from the strong-link regime to the weak-link regime, which had never been observed so far in one well defined system without external or chemical forcing. The latest development of this work consists in the investigation of several di-carboxylic acids effect on the mechanical response of the calcite paste.

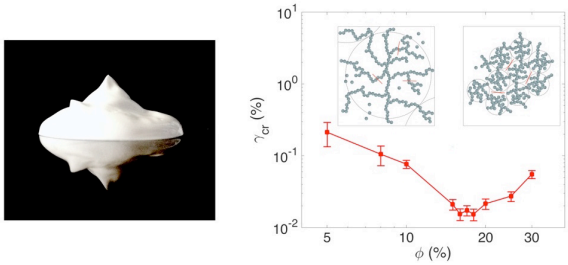

Figure 1: Yield strain of calcite suspensions exhibits a minimum versus concentration, a major prediction of colloidal gel theory, never verified so far.

[1] Liberto *et al*. (2017) *Soft Matter*, **13**(10): 2014-2023.
[2] Shih *et al*. (1990) *Physical Review A*, **42**(8): 4772.