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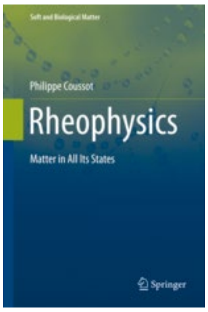

PH. COUSSOT

RHEOPHYSICS
MATTER IN ALL ITS STATES

Springer Series on Soft and Biological Matter.
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Most of everyday life materials are neither solid nor liquid of the kind we learn in a basic condensed matter physics course. Wood, tissues, our body, our food, much of the artificial stuff many current objects are made of, as well as most constituents of the natural landscape are all complex materials which can hardly be classified as solids or liquids. They often go under the general label of soft matter. But even hard matter like rocks, stones and sand, owe their formation and constitution to flow processes, whether eruptive or alluvial. The science of soft matter and its flow properties, despite its pervasive character, is hardly found in undergraduate materials physics textbooks, although it should be, as argued by Etienne Guyon in his illuminating foreword to the French edition of the book, an obvious subject already for the hands-on approach to school science teaching. This educational approach, first originating from an idea of Leon Lederman, had a follow-up in France with the programme *La main à la pâte*. Actually also at the academic and research levels France has greatly benefited in the area of soft matter from the great school of Pierre Gilles de Gennes.

This exceptionally clear textbook on rheology by Philippe Coussot represents a basic complement for undergraduate and graduate courses of materials physics and chemistry for both the degrees of Materials Science and Materials Engineering. The author owes the outstanding cross-disciplinary quality of the book to his personal experience in applied research related to civil engineering. In a perfect de Gennes tradition, properties of materials naturally emerge from their physical and chemical constitution, and rheology is presented under the unifying key point of the flow timescale *vs.* load. This allows to discover similarities among regimes in different types of systems, so as to lead to a concept of universality. An example is that linking suspensions to foams.

After an Introduction (Chap. 1) to real-life materials, and a rapid overview (Chap. 2) on the constitution and basic physical properties of simple materials like gases, simple liquids and solids, either crystalline or glassy, the book presents a series of chapters devoted to the various kinds of "non-simple" materials. They are suspensions (Chap. 3), polymers, polymeric solutions, cross-linked polymers and polymer gels (Chap. 4), colloids (Chap. 5), emulsions and foams (Chap. 6), and granular materials (Chap. 7). The last chapter treats rheometry, *i.e.*, the various experimental methods to measure the flow and related physical properties, and is followed by two essential appendices with the basics of fluid mechanics and elements of thermodynamics. All chapters are very well held together by a unifying view concerning the physico-chemical origin of the mechanical behaviour of so many different classes of complex materials. Some concepts and some links to the contents of current materials physics courses would need, perhaps, further expansion, like the solid flows occurring in extrusion and creep, the Nabarro-Herring mechanism, the possible self-similarity or self-affinity of spongy materials, etc.: all subjects, however, that a good teacher can easily expand finding in any case the appropriate seed in this excellent book.

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