Stuttgarter Physikalisches Kolloquium

Fachbereich Physik, Universität Stuttgart
Max-Planck-Institut für Festkörperforschung
Max-Planck-Institut für Intelligente Systeme

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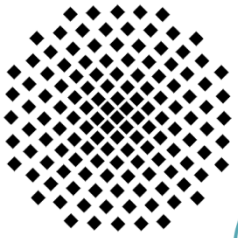

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Self-organized structures in soft materials

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Abstract

The majority of materials surrounding us is soft and complex, composed of many interacting constituents, and structured hierarchically. Describing the properties of such materials on different scales requires to address two theoretical and computational challenges: First, although many details of a finer description become irrelevant, there are effective couplings to microscopic degrees of freedom that have to be identified. Second, new "behavior" emerges that is not explained by the physical properties of single constituents alone. Recent advances in many-body statistical physics provide a powerful framework to address these challenges, exposing emergent physical principles through minimal models that are then studied through a combination of analytical theory and computer simulations. I will sketch this approach for active matter, a paradigm for the emergence of collective dynamic states in autonomous living and synthetic materials that are constantly driven locally. I will present some of our recent work on modeling self-organization from molecular to colloidal scales.