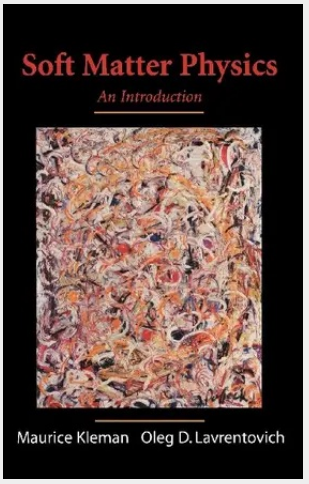
Kleman / Laverntovich

Soft Matter Physics

An Introduction



Introductions to solid state physics have, ever since the initial book by F. Seitz in 1940, concentrated on simple crystals, with few atoms per cell, bonded together by strong ionic, covalent, or metallic bonds. References to weaker bonds, such as van der Waals forces in rare gases, or to geometric or chemical disorder (e.g., alloys or glasses) have been limited. The physical understanding of this ?eld started well before Seitz's book and led to a number of Nobel prizes after the last war. Applications cover classical metallurgy, el- tronics, geology and building materials, as well as electrical and ionic transport, chemical reactivity, ferroelectricity and magnetism. But in parallel with this general and well publicized trend, and sometimes earlier as far as physical concepts were concerned, an exploration and increasingly systematic study of softer matter has developed through the twentieth century. More often in the hands of physical chemists and crystallographers than those of pure physicists, the ?eld had for a long time a reputation of complexity. If progress in polymers was steady but slow, interest in liquid crystals had lain dormant for forty years, after a bright start lasting through 1925, to be revived in the late 1960s based on their possible use in imaging techniques. The optoelectronic properties of the ? eld in general are even more recent.

This book is based on parts of lecture courses for graduate students and advanced undergraduates in hydrodynamics, soft matter physics, and materials science. The subject of the book has never been presented as a whole in a single text. Unlike other books in the field, this text covers completely and at an elementary level the subject of defects, which has become very important in the last few years. The coherence of the present project is in its particular stress on the concepts of order & disorder.

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