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Preface

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The rise and packing of atoms and groups of atoms largely determine the structure of solids. Defects or lattice imperfections generated by structural phase transitions virtually always lead to local displacements of atoms. Such displacements, albeit very small in magnitude, lead to further displacements of adjacent atoms and so forth. This weak pulling and pushing of atomic positions leads to effective strain-mediated interactions which are reviewed in this volume.

The macroscopic strain generated by a structural phase transition, i.e. the spontaneous strain, typically leads to relative changes of interatomic distances between 10^{-2} and 10^{-5}. These rather small changes nevertheless often dominate the mechanism of the phase transition, the formation of characteristic microstructures and the kinetic behaviour of atomic ordering processes. The significance of strain-related correlations stems from its long-range nature and the high degree of anisotropy of elastic interactions. The theory of ferroelasticity and related phenomena is largely focused on the analysis of long-range anisotropic effective interactions of this kind.

The experimental analysis of strain related phenomena has significantly advanced through novel and improved diffraction facilities which allow the analysis of diffuse X-ray diffraction over a dynamical range of more than six orders of magnitudes. The high sensitivity of diffraction experiments made the observation of characteristic microstructures possible, which holds the key for the quantitative analysis of strain mediated interactions. This volume comprises several review articles which illustrate the recent progress made (and the obstacles encountered) in the research on strain-related phenomena in crystalline solids.

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