Isosymmetric Phase Transitions in the Solid State

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The discontinuous transformations in crystalline solids without change of space symmetry, at high temperature and high pressure, attract special interest. It is convenient to attribute them to isostructural (isomorphous) phase transitions. However, the coincidence of the space groups on the both sides of the transition point is a necessary but not sufficient condition for such an attribution. The analysis of specific anomalies in the pressure/temperature-induced evolution of the certain parameters and their functional form should complement the identification procedure.

Different types of isosymmetric phase transitions, such as isostructural, anti-isostructural etc., will be defined and assigned to different non-symmetry breaking and symmetry breaking mechanisms. The role of the anharmonism of these mechanisms, and the coupling between them will be investigated.

The characteristic phase diagrams corresponding to every type of isosymmetric transformations will be presented. I will show specific details of the crossover between different transformation regimes and identify the corresponding critical points; these are the critical end point of the liquid-gas type and the Landau point.

Examples of isosymmetric transformations in rare-earth and transition metals, intermatallic compounds and oxides will be analyzed in the framework of a rigorous classification scheme.

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