

## Introduction to ferroics and current trends

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The term « ferroic » was introduced by Aizu approximately 50 years ago with the emerging conscience of a possibility to unify the vision of ferromagnetic, ferroelectric and ferroelastic materials. It describes materials which are characterized by the existence of an order parameter and show switchable properties under an external stimulus.

During the last decade, ferroics, and in particular those presenting multiple orders, i.e. multiferroics, have been the focus of an intense interest. This is due to the fact that they provide new opportunities to tackle crucial societal issues such as low energy data manipulation and storage.

A topical issue addresses the conditions for the existence of order, which intrinsically rely on symmetry considerations. The possibility to find new ferroic materials has been recently significantly revisited, and interesting paths have arisen, in particular *via* interface engineering.

The characterization of ferroics, and especially the elucidation of their domain structure, has also received special attention, and considerable experimental efforts have been developed to achieve characterization at different scales in complex structures.

This general introduction to the thrilling world of ferroics will therefore aim at giving a state of the art panorama addressing the present quest for new ferroics, the advanced characterization methods and the clever use of their properties for cutting-edge devices. Most of the examples will be given among oxide ferroics presenting magnetic and/or electric ordering.