

Foreword

About this special issue “Ferroelectricity and Multiferroics”

The special issue of the CMP journal Ferroelectricity and Multiferroics contains the papers of theoretical and experimental investigations in a wide range covering physical effects, properties and applications of ferroics—crystalline oxide, chalcogenide and hydrogen bonded materials with a long-range order parameter—spontaneous polarization, magnetization or strain. The order parameter arises due to the phase transition taking place with the temperature decrease, and at pressure or chemical composition variation. The phase transitions on the temperature—pressure—composition diagrams are investigated using different methods (first principles and model calculations, molecular dynamics simulations, mean-field analysis of thermodynamic properties) with the aim to search for the materials (monocrystals, ceramics and nanoparticles) having effective functional parameters, especially for multiferroics that have more than one of the interacting long-range orders. The fundamental physical research of nonlinear processes in ferroics on the nanoscale, with controlling the size effects, provides a background for developing nanostructures favourably applied in nanoelectronics and information technologies.

The nonlinear optical properties, the domain structure, the coupling between spontaneous polarization and deformation in ferroics with multistable states, reentrant phases, flexocoupling and a giant magnetoelectric coupling, superparamagnetism, antiferromagnetic and antiferroelectric phases, transitions into incommensurately modulated phases the role of the developed fluctuations in the critical region and precursor polarization clustering effects in crystals, peculiarities of the behaviour of the relaxors and caloric effects are theoretically and experimentally investigated in a set of papers included into this special issue. We hope that they will be of great interest to the readers that are involved in the research of the related scientific directions.

It is our great pleasure to thank the authors of the papers who kindly agreed to support this project. Needless to say that only due to their kind response, an idea of such an issue has become true; their agreement to submit their papers is appreciated very much. We wish to thank the anonymous referees for careful reading the manuscripts and for preparing reports with useful comments and criticism which helped to improve the papers. A lot of thanks go to the CMP staff who took care about the issue after the acceptance of the papers.

The idea to prepare a collection of papers on ferroelectricity and multiferroics was inspired by a common wish of our community to make a present to the 80th birthday of Professor Roman Levitskii — a well-known researcher in the physics of ferroic crystals and in the theory of spin systems. To our great sadness Roman Levitskii passed away at the end of October 2022, just about 3 months before his 80th anniversary which we had intended to celebrate on January 6, 2023. On behalf of the CMP editorial board, numerous colleagues and a whole solid state community, we wish to express our common desire to dedicate this issue to the memory of Professor Roman Levitskii.

Yulian Vysochanskii (Institute for Solid State Physics and Chemistry, Uzhhorod National University, Uzhhorod, Ukraine)

Oleg Derzhko (Institute for Condensed Matter Physics of the National Academy of Sciences of Ukraine)