

# Preface

In the course of a year or slightly more that passed since the discovery of a new class of high-temperature superconductors (HTSCs) in FeAs-based compounds [1], the world's community of physicists, chemists and technologists achieved a substantial progress in understanding the mechanisms and details of this superconductivity. The intensity of researches coming about is comparable only to that which accompanied the discovery of HTSCs in cuprates. However, the present scientific context is markedly different from that having existed twenty years back. In those times, the researchers moved on while blindly palpating the terrain. At present, they can rely on a rich accumulated experience of work with complex compounds; novel experimental methods and numerical calculation schemes have emerged; computational resources became by far much more powerful, and, last but not least, the physical ideas elaborated in the studies of cuprates could have been immediately adapted for the study of new HTSC compounds.

An unprecedentedly fast advance of researches on the FeAs compounds was helped by an instantaneous propagation of knowledge via electronic data archives. A markedly international character of studies is noteworthy; as a rule, the articles on FeAs systems are published by joint teams of distant lands and laboratories that boosts a rapid augmentation of knowledge about the properties of systems under study and thinking over the wealth of experimental data. During last years (2008–2010), more than few thousand publications within this domain have appeared. This means that every day brought about, on an average, 2–3 new papers deposited in electronic archives.

If the epic of HTSC study in cuprates demanded years for arriving at some understanding of these materials' nature, with respect to new class of materials one year was sufficient as a due time to make a primary overview of the results obtained. Within half a year after the discovery of HTSC in FeAs compounds, first three reviews appeared in the *Physics – Uspekhi* [2–4]. In the beginning of 2009, a special issues of *Physica C* [5] and *New Journal of Physics* [6] appeared with review articles by leading scientists on the basics of the physics of the FeAs compounds, which also summarized the bulk of results accumulated within a year.

This book seems to be the world's first monograph on the physics of FeAs systems. It outlines in a systematic way the results of researches done in the global scientific community throughout the whole period since the end of February

2008, as the high-temperature superconductivity has been discovered in a LaOFeAs system.

The first three chapters cover experimental investigations of all classes of the FeAs compounds in which superconducting state has been discovered. The fourth chapter is devoted to theory models of these compounds and to the discussion, on this basis, of experimental results. Differently from the reviews published in [5, 6], which specifically addressed various aspects of the physics of FeAs systems in some detail, we attempted here to cover, within a unique concept, the whole bulk of experimental and theoretical material on these systems by now available. The authors' hope is that the book be of use for a broad fold of readers: those who already immediately work in this problem and who would wish to enter it.

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