Summary

The present Ph.D. thesis is devoted to detailed studies of structural and magnetic properties of the compounds with the chemical formula $MFeO_2$ (M = Ag, Cu) called delafossites. These ferrites belong to multiferroics, which attract significant attention among researchers nowadays because of their unique physical properties and potential applications. For the purpose of the $AgFeO_2$ and $CuFeO_2$ synthesis, three methods were selected. Co-precipitation, hydrothermal synthesis, and mechanical activation with post-synthesis thermal treatment were employed. Structural investigations were performed by X-ray diffraction (XRD) and scanning electron microscopy (SEM). Mössbauer effect spectroscopy and SQUID magnetometer were used to investigate the magnetic properties in the magnetic transition temperatures range.

The dissertation was divided into seven chapters. In the first one, the thesis was stated. The next two presented the current state of knowledge, which gave insight into the reasons for interests in the main subject of this work. Chapters 4–6 were devoted to describing synthesis methods, experimental details, and brief characterization of employed investigation techniques. Chapter seven presented the results of the investigations and their detailed discussion. In the end, a summary and conclusions were drawn.

The main aims of the research were the synthesis of $AgFeO_2$ and $CuFeO_2$ by low-temperature selected methods and the determination of the structural and magnetic properties. It allowed finding the relation between the hyperfine interactions and the microstructure of the material in the range of the Néel temperatures. Moreover, investigations pointed out that pure ferrites could be obtained without any exceptional conditions in the very economical way, which distinctively raises the delafossite chances for future applications.

The author's original achievement primarily was to show that microstructure effects could modify the silver and copper ferrite magnetic properties. Moreover, the new way for $CuFeO_2$ synthesis was developed, i.e., mechanical activation. The research was cognitive, and the achieved results may contribute to the current state of the knowledge about the hyperfine structure in context of the synthesis method.

Keywords: delafossites, Mössbauer spectroscopy, multiferroics, magnetic properties, co-precipitation, hydrothermal synthesis