

Supervisors' statement about Ph.D. thesis of Damian Rybicki, MSc
titled

**'Nuclear magnetic resonance study
of selected Ruddlesden-Popper manganites'**

The submitted Ph.D. thesis deals with cubic and layered perovskite manganites. The theme is devoted to the NMR study of structural, electronic and magnetic properties of these compounds. Experimental studies were carried out by using advanced techniques of nuclear magnetic resonance (NMR) in magnetic materials in zero and nonzero external magnetic fields, in dependence on temperature and on parameters of pulse experiments.

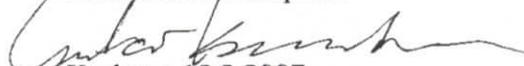
The thesis consists of six main chapters. A chapter devoted to the description of basic characteristics of manganese perovskite systems (Ch.2) is followed by a brief introduction to the principles of NMR and its applications to magnetic systems (Ch.3). Substantial part of the doctoral work is presented in the next four chapters (Ch.4-7) where the results obtained by D. Rybicki are described and consecutively commented for the individual systems studied: pseudocubic perovskites ($\text{La}_{0.875}\text{Sr}_{0.125}\text{MnO}_3$, $\text{La}_{0.85}\text{Sr}_{0.15}\text{MnO}_3$, $\text{La}_{0.9}\text{Ca}_{0.1}\text{MnO}_3$), nanoparticles of $\text{La}_{0.75}\text{Sr}_{0.25}\text{MnO}_3$ and bilayered manganese perovskites ($\text{La}_{2-2x}\text{Sr}_{1+2x}\text{MnO}_3$).

Perovskites, in general terms, make up an extremely interesting group of oxides, exhibiting enormous variety of macroscopic physical properties in dependence on the basic composition formula and applied substitutions, and also on preparation technique and particle size. The results achieved in the frame of the thesis (summarised concisely in Chapter 8. Conclusions) contribute adequately to the understanding of the introduced perovskite manganese systems.

The theme is complex both from the point of view of the structural, valence and spin problems of manganites and from the point of NMR of broad spectral lines and samples having short spin-spin relaxations. To obtain reliable NMR results, a great attention was paid to the adequate methodology of the performed NMR experiments, namely to the time consuming measurements of the dependence of spectral lines on pulse separation in echo experiments. Without this careful attitude it would not be possible *e.g.* to reveal the presence of Suhl Nakamura interaction enabling to discuss the phase segregation problems.

Mr. Damian Rybicki performed tasks of his doctoral work carefully and thoroughly with a great deal of his personal initiative and invention. Scientific level of the thesis and related papers already published in international journals confirm his qualification for an independent research activity. The thesis is therefore recommended for the defense.

Prof. Czesław Kapusta



Krakow, 19.2.2007

co-tutors

Doc. RNDr. Helena Štěpánková, CSc.

