

Supervisor's statement on the PhD thesis "Magnetic and magnetoelastic properties of *f-d* intermetallics with high content of *3d*-metal" by Denis I. Gorbunov

Denis Igorevich Gorbunov graduated from the Physical-Technical Faculty of the Ural State Technical University in Ekaterinburg in 2010. As a master course student, he worked in Laboratory of Ferromagnetic Alloys in the Institute of Metal Physics of the Ural Branch of the Russian Academy of Sciences on the topic "Crystal structure and magnetic properties of bulk and nanocrystalline alloys R-Fe-Ga-C (R – Pr, Sm) based on the tetragonal BaCd₁₁-type phase" (finally resulting in 5 publications in revised issues). Then he was recommended to me by his supervisor Dr. Alexander G. Popov and head of the Laboratory Prof. Dr. Nikolai V. Mushnikov. After successfully passing through entrance examinations, on 01.10.2010 he became a PhD student at the Faculty of Mathematics and Physics of Charles University in Prague under my supervision and simultaneously he became a researcher in our group at the Institute of Physics of the Academy of Sciences of the Czech Republic.

Denis Gorbunov passed successfully all the exams of the PhD course and concentrated on the research topic of his PhD thesis "Magnetic and magnetoelastic properties of *f-d* intermetallics with high content of *3d*-metal". First we planned to continue to study interesting "1-11" ternary intermetallics of his master thesis, especially their magnetic anisotropy. However, after we tested the possibility of growing their single crystals by Czochralski method, we came to the conclusion that it is impossible due to their non-congruent melting. Therefore, for the PhD work we selected another group of ternary intermetallics, RFe₅Al₇ (R = heavy rare-earth metals). Despite large attention attracted by these compounds with a generally accepted opinion that they are very interesting, there was no work performed on single crystals. Since there were indirect but clear indications pointing to a high magnetic anisotropy of RFe₅Al₇, we decided to perform our study exclusively on single crystals.

Denis Gorbunov showed himself as a well-educated and enthusiastic researcher. He contributed considerably to sample preparation and their characterization. He performed numerous magnetization, magnetoelastic, electrical resistivity and specific-heat measurements with full treatment of the results. He participated considerably in the interpretation of the results, preparation of papers and reports, presentation of the results at many conferences. He exhibited initiative and ability to perform independent research, which is confirmed by the fact that he successfully carried out his own PhD-student research project of the Grant Agency of Charles University.

Denis Gorbunov, in addition to the regular PhD course in the field of solid-state physics at Charles University, enhanced his qualification at a 5-week neutron and synchrotron radiation course HERCULES (Higher European Research Course for Users of Large Experimental Systems) at the Institute Laue-Langevin and European Synchrotron Radiation Facility (ESRF), Grenoble and Laboratoire Léon Brillouin (LLB) and synchrotron SOLEIL, Paris, in 2013.

Denis Gorbunov participated actively in the international collaboration of our group, especially with High-Field Laboratory in Dresden-Rossendorf (Germany). There he extended our results obtained in Prague up to 14 T fields to pulsed fields up to 60-65 T, not only on “1-5-7” compounds of his PhD thesis but also on many other rare-earth and uranium intermetallics. He also performed some neutron-diffraction studies at the reactor FRM II in Munich and at LLB in Saclay in France and an experiment at ESRF in Grenoble.

During his work in Prague, Denis Gorbunov has published 13 papers on “1-5-7” intermetallics (including 2 in PRB) plus 9 papers (including 2 in PRB) on related rare-earth and uranium compounds. He speaks good English and has a good knowledge of the Czech and Portuguese languages. He has good relations with his colleagues. I think he satisfies completely all requests of the PhD title and believe that he will successfully defend his thesis.

Prague, July 21, 2014

Prof. Dr. Alexander V. Andreev, supervisor of PhD work of Denis I. Gorbunov.