Multiferroic perovskites under epitaxial strain
Daumont, Cristophe
First of all, I would like to thank my supervisors, Prof. dr. Beatriz Noheda and Prof. dr. Thom Palstra, for giving me the opportunity to enroll as a Ph.D. student, within the European project MaCoMuFi, at the University of Groningen, in the solid state chemistry department within the thin film part of the group. Beatriz, I could not thank you enough for all the advice and great guidance through all these four years, not only for the thesis in itself but also to build an international prospective for my future carrier. You were also here to discuss about personal matters, which forged even more respect. I am really proud of having been under your supervision during these four years. I would also like to address my gratitude to you, Thom. Your skills, scientific criticisms and experience have been really useful to go further in this work. Even though your time went more and more limited through the years, you always had constructive criticisms. I would also like to address many thanks to Dr. Gustau Catalan. He made the TbMnO$_3$ target and grew the first TbMnO$_3$ film in our laboratory. At that time, I was still working on BiFeO$_3$ but, because he had to leave, I got in charge of this project. Many samples after this, has become the subject of my thesis. I would also like to thank Dr. Diego Rubi. From you, I have learned how to perform magnetic measurements. I have benefited from your knowledge and I am very grateful for that. I would also like to thank Dr. Dan Mannix for the time spent working together on the structure of the TbMnO$_3$ thin films during the synchrotron time at the ESRF in Grenoble, France. Your skills and knowledge of the beamline made the measurements a very nice time with lots of useful data that were crucial for this work. I hope we can continue investigating properties of materials. I would also like to thank Dr. Wolfgang Caliebe for his technical help during the synchrotron measurements at the W1 beamline in HASYLAB, Hamburg, Germany. Thank you very much for your availability and quick response during the measurements. I also have to thank Sriram Venkatesan, Dr. ir. Bart Kooi and Prof. dr. Jeff de Hosson for the TEM measurements presented in this thesis and for the very useful discussions. I would also like to thank ir. Gert Ten Brink for the SEM pictures and EDX analysis of some the PLD targets, which are not presented.
in this thesis but were very important for other projects. I would also like to thank Prof. dr. Ria Broer and Prof. dr. Coen de Graaf for performing the cluster calculations presented in Chapter 4. Those results were crucial for the understanding of our experimental data and the answer would not have come out without your input. I would also like to thank all the members from the MaCoMuFi (Magnetoelectric coupling on multiferroic thin films) project for the useful discussions and the very interesting work being performed from groups involved in this project. Specially, useful discussions with Xavier Marti and Florencio Sanchez are greatly acknowledged. I would also like to thank Dr. Maxim Mostovoy for useful discussions. I would also like to thank Prof. dr. Petra Rudolf and Regis Gengler and Tatiana Landaluce Fernandez, from her group, for allowing me some XPS time and the useful help and discussion during some measurements. I would also like to thank Henk and Jacob for their technical expertise that helped solving and teaching how to solve technical problems. Many things would not have been possible without you. I would also like to thank Henriet for the administrative work. You were always very helpful and informative about administrative matters that makes my daily life easier.

I feel very grateful to Prof. Josep Fontcuberta, Prof. dr. Petra Rudolf and Prof. dr. ir. Paul van Loosdrecht for being members of my reading committee and for their useful suggestions to improve the manuscript.

I will remember forever my stay in Groningen in the group of Solid State Chemistry. Thanks to all the group members for the work atmosphere. The combination of a thin film part and a bulk part within the group made the discussions really interesting and inspiring. Thank you, Gwilherm, Umut, Claire, Mufti and Johan for the nice scientific discussions and your experimental skills. I would not have been able to reach that point in the measurement of the physical properties without our discussions. Specially, I would like to thank Gwilherm, Claire, Umut and Mufti for the very nice discussion. Of course, I would also like to thank Gijsbert and Ard for the useful discussions concerning the thin film part of my PhD work. Ard, your knowledge of the PLD system was crucial in the setup of the lab when we all started. Without you, Henk and Gustau, it would have taken much more time for the system to be ready when it arrived. We shared the same office during those four years and I thank you for never complaining about the perpetual mess on my desk. Gijsbert, thank you for the valuable and enjoyable discussions.

I also thank all the past, current and new members of the Solid State Chemistry group. Thank you for contributing to the life of the lab and for sharing discussions. Thank you Diego, Anne, Mylene, Claire, Mufti, Gwilherm, Anthony, Saeedeh, Gijsbert, Ard, Coen, Umut, Aramel, Josee, Brian, Jeroen, Johan, Henk, Jacob, Graeme, Syarif, Igor, Szili, Oana, Shiva and visitors Alexander, Irina, Javier and Eric. I would also like to thank all the friends I met in Groningen during those 4 years. First of all, I would
like to thank the 'French' mafia: Gwilherm, Aymeric, Claire, Galice, Mélanie, Jolanda, Damien, Bérénice, Anthony, Julien, Juliette, Martijn. Thank you all for the nice moments we shared. Thank you also for sharing many things and for your friendship. I would also like to thank the 'Italian/Spanish' mafia: Alessio, Filipo, Andrea, Daniele, Tatiana, Luminita. Thank you for your friendship and the nice time we shared. I would also like to thank Primož, Tom, Simon, Andreas, Gaston, Dejan for nice drinks and discussions and people from the volley-ball I enjoyed playing with. I would also like to thank all the people I met during my short stay in the student house. Thank you Jeannine, Thanos, Elyse, Adam, Agatha, Amara, Mani, Max, Katharina, Soren. I also would like to thank all the people that I might have forgotten to mention for sharing time. Finally, I would like to thank my family for their long distance support over the four years. I cannot say how much I love you all and I dedicate this work to the freedom you gave me to pursue my studies around France and further. Without all this, I would not be where I am today and I am forever grateful.

Christophe Daumont
Groningen
September 21, 2009