## Acknowledgements

First of all, I would like to thank my advisors, Professor Francesc Díaz and Dr. Rosa Mª Solé, for their support, guidance and encouragement over these years. I would like to thank Professor Díaz for giving me the opportunity to work in his group and for letting me collaborate from time to time with his many colleagues and friends around Spain.

The support I received from the other senior members of the *Física i Cristal-lografia de Materials* group of the Rovira i Virgili University has been invaluable. I would especially like to thank Professor Magdalena Aguiló for sharing her knowledge of crystallography with me, for entering into innumerable discussions with me and for always having her office door open to me. I am very grateful to Dr. Jaume Massons and Dr. Josefina Gavaldà for helping me with the optical characterisation of the materials and to Dr. Massons especially for the time he invested in these projects at the beginning of my Thesis, and sharing a sandwich and a drink in the gardens of *Cristaleria Española S.A.* I would also like to thank to Dr. Xavier Ruiz for always having his office door open and for his always being positive. To all of you, thank you very much for your many interesting discussions and for all the fun both at work and after.

I would like to express my appreciation to all the research groups that have collaborated with me during this Thesis. I have had the great pleasure of working with Dr. Velin Nikolov from the Bulgarian Academy of Sciences, whose sharp insight and good sense of humour have been a great source of inspiration. His excellent teaching and our pleasant and fruitful collaboration will long be remembered. I am also grateful to Professor Joaquín Fernández for inviting me to the *Universidad del* País Vasco, and especially to Dr. Rolindes Baldas for her kind hospitality. I am much indebted to Professor Benoît Boulanger for allowing me to share his vast knowledge of physics, especially in the field of non-linear optics, at the Laboratoire de Spectrométrie Physique in the Université Joseph Fourier in Grenoble (France), and to everybody there, in particular Associated Professor Patricia Segonds, for making my stage in France most enjoyable. I also acknowledge Professor Georges Boulon for inviting me to the Laboratorie de Physico-Chimie de Matériaux Luminescents in the Université Claude Bernard in Lyon (France), and to everybody there, in particular Dr. Alain Brenier, for helping me with the measurements and interpretation of the spectroscopic properties of Yb in these crystals. I had a really great time there. Also, I greatly appreciate the revision of the Judd-Ofelt calculations by Dr. Carlos Zaldo at the *Instituto de Ciencia de Materiales de Madrid*, the refinement of the structures of single crystals by Professor Xavier Solans at the *Universitat de Barcelona*, the measurements of AFM by Professor Frank Woensdregt at the University of Utrecht, and the measurements of neutron powder diffraction by Dr. José Luís García Muñoz of the Institut de Ciència de Materials de Barcelona and at the Institute Laue-Langevin in Grenoble (France). I thank them all for many engaging

discussions, not only some excellent discussions about science but also some very enjoyable nonscientific discussions outside the lab.

It has been a pleasure to work with all the former members of the group of *Fisica i Cristal·lografia de Materials*. I thank Javier Mateos, for always being my best friend, Ana Aznar, for her constant good sense of humour, Isabel Parreu for her never-ending scientific spirit, Sandra Peña, for her humanity, and Fran Güell. I would like specially acknowledging to Agustí Montero for his ever-helpful solutions in the everyday life at the laboratory and for his constant fun both at work and after. I would also like to remember here everybody who started or finished their Thesis in our group and are now working in other places, Dr. Cinta Pujol, for all her confidence and the time we shared and for showing me the importance of the positive side of life, and Arantxa Vilalta, for her never-ending support and friendship over these years. Although not a member of our research group, I would also to acknowledge the great moments I spent with Dr. Mauricio Rico, for sharing all his knowledge about erbium with me and for showing me the nightlife in Madrid. To all of you, thank you very much for everything!

I owe much to my wonderful friends for the best of times. Special thanks to Rosana Gimeno, Margarita Hernández, Sergio Peris, Antonio Viso and Alicia Maroto and their partners, for their neverending support and for listening to me when I needed it.

I would also acknowledge Kevin Costello, who has read all this Thesis except this paragraph, for the effort he has made to correct how this Thesis has been written in a record time. Thank you very much indeed!

Most of all, I am deeply grateful to my parents, Eulalia Martí and Josep Carvajal, for their never-ending commitment and for showing me that anything is possible. I thank my brothers, Marc and Sergi, for the tremendous encouragement they have always given me, and my sister Marina, who always relaxes me when I play with her. Also I need to acknowledge Maria José for her loyalty. Finally, I thank my partner Carlos Quintero who is first of all my best friend and who has given me the best possible support during this Thesis, listening to me, learning with me, encouraging me, being such a lovable person and sharing his life with me.