

Preface

This book has a very ambitious title, stating the original target of the Editor to present a collective work addressed at a critical analysis of the various physical and chemical aspects of defect interaction in semiconductors.

In the due of the long preparation of this book, we realized soon that it was almost impossible to take into detailed and critical consideration all semiconductors of practical interest. For this reason, silicon has been mostly used by the different Authors as the reference material, not only because it is still the most studied semiconductor, but because it is also a very useful example of how far the interaction of point and extended defects influences the physical and chemical properties of semiconductors and of how critical is their knowledge in semiconductor technology.

In fact, the interest for a deep understanding of the physics and chemistry of these interactions is not purely speculative, as we know from the tremendous development of experimental and theoretical tools aimed at supporting the progress in microelectronics-, and, possibly, in opto-electronics and in nanotechnological applications.

Among many others, one of today's concerns is about the possibility of a careful control of sub-micrometric defects like vacancy voids in silicon, supposed to be detrimental to the integrity of the gate oxide in MOS devices, by a proper knowledge of the thermodynamics and kinetics of defect clustering processes during the growth of Czochralski silicon. Another topic of key interest for the development of silicon-based optoelectronic devices is the understanding of the influence of oxygen- and metal-segregation at dislocations on their room temperature luminescence and of the known influence of dislocations on the efficiency of band edge emission.

As well, the proper control of gettering processes is based on a deep knowledge of inter-defect and defect-impurity interactions in a wide range of temperature, where the kinetics of gettering is also ruled by diffusion and trapping processes.

To accomplish our attempt to give a critical assessment of at least some of the key issues of our subject, more than an updated review of literature in the field, the Editor suggested and the Authors accepted to contribute with Chapters based on their own specific views and expertise on few selected topics, dealing mostly with the properties of defects and light impurities in silicon and with the chemical, structural, electrical and mechanical consequences of the interaction of light and metallic impurities with extended defects and with the clustering of defects and impurities in silicon. The Chapters VII and VIII present instead the Authors views about the role of ultrasound stimulated defect reaction and about the nature of the interaction of small molecules on the silicon surface, the latter taken as examples of other types of interactions, where the chemistry of the interaction plays the major role.

Although being aware of the main limitations of this book, the Editor and the Authors hope having provided a profitable tool for any reader who would like getting deeper insight into this subject.

Acknowledgments

The work of the Editor was possible thanks to the enthusiastic co-operation of all the friends and distinguished colleagues who co-authored the book, to whom the Editor is also indebted for the tolerance they manifested to me for the delay in delivering to the Publisher the final version, due to unfavourable circumstances and late renounces.

I am for this reason especially grateful to the colleagues Chevallier, Pajot, Sumino and Yonenaga who were the first presenting their Chapters.

In behalf of all the authors I am also grateful for the permission of reporting in this Book diagrams and literature pictures, which are indeed an important part of this work.

I am personally indebted to Wolfgang Schröter for valuable discussions and advices, particularly important for finding a reasonable equilibrium between physico-chemical and physical arguments.

Last but not least, I also like to warmly thank Anna, who was very close to me in these last years with an intimate feeling of confidence and cleverness.