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Nota di contenuto	Advanced Silicon Materials for Photovoltaic Applications; Contents; Preface; List of Contributors; Chapter 1 Silicon Science and Technology as the Background of the Current and Future Knowledge Society; 1.1 Introduction; 1.2 Silicon Birth from a Thermonuclear Nucleosynthetic Process; 1.3 Silicon Key Properties; 1.3.1 Chemical and Structural Properties; 1.3.2 Point Defects; 1.3.3 Radiation Damage and Radiation Hardness; 1.4 Advanced Silicon Applications; 1.4.1 Silicon Radiation Detectors; 1.4.2 Photovoltaic Cells for Space Vehicles and Satellite Applications

1.4.3 Advanced Components Based on the Dislocation oxLuminescence in Silicon
1.4.4 Silicon Nanostructures; References; Chapter 2 Processes; 2.1 Introduction; 2.2 Gas-Phase Processes; 2.2.1 Preparation and Synthesis of Volatile Silicon Compounds; 2.2.2 Purification of Volatile Silicon Compounds; 2.2.3 Decomposition of Volatile Precursors to Elemental Silicon; 2.2.4 Most Common Reactors; 2.2.5 Recovery of By-Products; 2.3 Production of MG and UMG Silicon and Further Refining Up to Solar Grade by Chemical and Physical Processes; 2.3.1 MG Silicon Production; 2.3.2 Metallurgical Refining Processes
2.3.3 Metal-Metal Extraction Processes
2.3.4 Solid/Liquid Extraction Techniques; 2.3.5 Final Purification by Directional Solidification; 2.3.6 Solar-Grade Silicon Production from Pure Raw Materials or Via the Direct Route; 2.4 Fluoride Processes; 2.5 Silicon Production/Refining with High-Temperature Plasmochemical Processes; 2.5.1 Silicon Production Via Plasma Processes; 2.5.2 Silicon Refining Via Plasma Processes; 2.6 Electrochemical Processes: Production of Silicon Without Carbon as Reductant; 2.7 Conclusions; Acknowledgements; References; Chapter 3 Role of Impurities in Solar Silicon
3.1 Introduction
3.2 Sources and Refinements of Impurities; 3.3 Segregation of Impurities During Silicon Growth; 3.3.1 Equilibrium Segregation Coefficients; 3.3.2 Effective Segregation Coefficient; 3.3.3 Distribution of Impurities in Silicon Crystal Due to Segregation; 3.4 Role of Metallic Impurities; 3.4.1 Solubility and Diffusivity; 3.4.2 Impact on Charge-Carrier Recombination; 3.4.3 Modeling the Impact of Metallic Impurities on the Solar-Cell Performance; 3.5 Role of Dopants; 3.5.1 Carrier Mobilities in Compensated Silicon; 3.5.2 Recombination in Compensated Silicon
3.5.3 Dopant-Related Recombination Centers
3.5.4 Segregation Effects During Ingot Growth; 3.5.5 Detecting Dopants in Compensated Silicon; 3.6 Role of Light Elements; 3.6.1 Oxygen; 3.6.2 Carbon; 3.6.3 Nitrogen; 3.6.4 Germanium; 3.7 Arriving at Solar-Grade Silicon Feedstock Definitions; References; Chapter 4 Gettering Processes and the Role of Extended Defects; 4.1 Introduction; 4.2 Properties of Transition-Metal Impurities in Silicon; 4.2.1 Solubility of Transition-Metal Impurities; 4.2.2 Diffusion of Transition-Metal Impurities; 4.3 Gettering Mechanisms and their Modeling
4.3.1 Segregation Gettering

Sommario/riassunto

Today, the silicon feedstock for photovoltaic cells comes from processes which were originally developed for the microelectronic industry. It covers almost 90% of the photovoltaic market, with mass production volume at least one order of magnitude larger than those devoted to microelectronics. However, it is hard to imagine that this kind of feedstock (extremely pure but heavily penalized by its high energy cost) could remain the only source of silicon for a photovoltaic market which is in continuous expansion, and which has a cumulative growth rate in excess of 30% in the last few years. Ev
