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Solar Grade Silicon Feedstock

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5.1 INTRODUCTION

The Photovoltaic (PV) industry is still in its infancy and at the moment it is very difficult to predict which technical, economical and social patterns its deployment will follow before reaching maturity. However, if photovoltaics are to become a major energy source in the future, it is appropriate to question which materials and which natural elements are critical to secure the long-term sustainability of this energy source. This is particularly valid for the semiconductor materials whose band gap has to perform the efficient conversion of sunlight to electricity. The recent history of photovoltaics (from the 1950s) reveals an intense activity of research and development embracing a broad range of disciplines and leading to a healthy multitude of innovations. Organic versus inorganic semiconductors, intrinsic versus extrinsic semiconductors, homojunctions versus heterojunctions and amorphous versus crystalline structures are a few dilemma that new research achievements steadily bring to the scientific and industrial community. It will take years, perhaps decades, before mankind is able to solve the challenge and answer the questions addressed above. (These aspects are also described in Chapters 6 to 16 of this handbook.)

Up to now, the dominant semiconductor material used in photovoltaics is silicon, particularly crystalline silicon. The most recent market surveys issued by commercial consultants, (trans)governmental organisations and agencies clearly state this fact.[1] Analysing annual growth by means of technology and material from these quoted sources, multicrystalline silicon takes the lion's share of the growth. In the first half of the 1990s,

[1] For PV News edited by Maycock (2001), commercial shipments to terrestrial and indoor applications of cells or modules based on non-silicon technologies accounted in 2000 for just 1.2 MW of a total 288 MW, that is, 4.2 per thousand. Amorphous silicon was credited in the same period 27 MW shipment or 9.4% and crystalline

Handbook of Photovoltaic Science and Engineering. Edited by A. Luque and S. Hegedus
 ISBN: 0-471-49196-9