6

Bulk Crystal Growth and Wafering for PV

W. Koch[1], A. L. Endrös[2], D. Franke[3], C. Häßler[1], J. P. Kalejs[4] and H. J. Möller[5]

[1]*Bayer AG, Krefeld, Germany,* [2]*Siemens and Shell Solar GmbH, Munich, Germany,* [3]*Access e.V., Aachen, Germany,* [4]*RWE Schott Solar, Massachusetts, USA,* [5]*TU Bergakademie Freiberg, Freiberg, Germany*

6.1 INTRODUCTION

The workhorse of the photovoltaics industry is silicon. More than four out of five amperes of solar-module produced current come from crystalline silicon modules. Of this amount, over 50% is produced by a steadily increasing share from multicrystalline silicon material.

Silicon solar cells first were made about 50 years ago from Czochralski (Cz)-pulled monocrystals with technology adapted from the microelectronics industry. Subsequently, world-record cell efficiencies have been achieved at a very high cost on a laboratory scale with Float Zone (FZ) monocrystals.

Cost pressures have forced the development of multicrystalline material solidification processes for production of very large silicon ingots (blocks), which have reached typical sizes of 250 kg in 2000. A good theoretical understanding of growth processes, together with numerical simulations of the entire process down to a microstructural defect level in the crystal today has resulted in the economical production of high-quality material. Sawing of silicon crystal into the thin wafers required for the best performance in solar cells wastes about 50% of expensive, pure silicon feedstock and is very costly. This has led to the development of several crystalline silicon foil, that is, ribbon production processes, and these are now in various stages of R&D and commercialization.

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