Sensors and Materials, 3, 1 (1991) 009–023
MYU, Tokyo

S & M 0067

From Bulk Crystalline Age to Multilayered Thin Film Age
—A Technological Evolution from Micro- to Macroelectronics—

Yoshihiro Hamakawa

Faculty of Engineering Science, Osaka University
Toyonaka, Osaka 560, Japan

(Received June 3, 1991; accepted August 7)

Key words: technological forecast, film deposition, thin-film growth, tunable color EL devices, amorphous silicon solar cells, thin-film transistors, facsimile read-out devices, photoreceptors, light emitting device, optoelectronics

A new trend in semiconductor electronics is forecast and discussed in view of a technological evolution from the bulk crystalline age to the multilayered thin film age. Firstly, recent progress in thin film deposition technologies is reviewed. Secondly, some new kinds of functional devices making full use of thin-film-growth technologies, such as wide-area, nonepitaxial, low-temperature growth, are demonstrated from technologies currently being developed; that is, tunable color EL devices, amorphous silicon solar cells, amorphous silicon thin-film transistors, facsimile read-out devices, photoreceptors and a new type of light-emitting device. In the final part of this paper, the current state of the art in the field of optoelectronics with these newly developed functional devices is reviewed, and their market expansion into the 21st century is forecast. A new trend—a technological evolution from MICROELECTRONICS to MACROELECTRONICS—is proposed and discussed.

1. Introduction

With recent progress in high-vacuum technology and ultrapurification, remarkable advances have been seen in thin-film technologies for a wide variety of