

China's Semiconductor Industry and the Global IC Environment

Hailing Tu

National Engineering Research Center for Semiconductor Materials, General Research Institute for Nonferrous Metals, Beijing, 100088, China

After 40 years' struggle, China's IC industry steps into a new stage at high growth rate. The joint venture IC fabs can operate based on 0.5-0.25 micron technology. The major silicon materials companies can manufacture 200 mm wafers for deep sub-micron IC and now are engaged in research of 300 mm crystal growth [1,2]. Fig. 1 illustrates CZ silicon crystals with various diameters grown in General Research Institute for Nonferrous Metals (GRINM) from 1957 to 1999, which may represent the historic records in China [3].

The paper then presents research and development of silicon and silicon based materials and IC manufacturing [4,5], by emphasizing the technology development and providing the recent relevant data.

To accelerate this development, the central and many local governments have initiated a series of preferential policies such as tax reduction and zero rent of land aimed at promoting software, IC and silicon materials sectors of the national economy [6,7]. Intellectual property (IP) awareness grows and education in IP related laws that were issued in April 2001 is expanding.

The domestic IC requirements have also been discussed (see Fig. 2). The market drivers include communication devices, personal computers and consumer products, which will push China's IC and silicon materials industries to undergo an unprecedented expansion in the new century [8].

The tenth five-year-plan and long term strategy are described, which consist of building dozens of IC production lines of CPU, DSP, DTV and SOC with sub-quarter micron technology and hundreds of design houses having IP cores, increasing the capacity of large diameter silicon wafers and enhancing the activities on silicon based materials such as SOI, SiGe and so on. The actual and forecast of IC manufacturing in China are plotted in Fig. 3, which shows a steady increase with a growth rate higher than the average of the world IC industry. 20 billion chips and 10 billion USD sales are planned, and 500 million square inch silicon wafers are targeted for 2005. The forecast of IC production volume and revenue in 2010 are 50 billion chips and 25 billion USD [9].

Finally, it has been predicted that the global IC cycle time will be reduced and the industry bouncing back with a modest growth in 2002. However, China's IC industry has not been drastically affected which will certainly contribute to the regional development. As a consequence of the new economy, the world IC and silicon wafer manufacturing enterprises will be transferred to China and other developing countries. Reconstruction of the semiconductor industry and change of the global IC environment may, therefore, occur in the next decade.

References

- [1] H. Tu, Proc. Nation. Sym. Semicon. Sil. Mater., p1 (2000)
- [2] H. Tu, Q. Zhou, G. Zhang J. Wang, Q. Chang, F. Fang, Z. Wu and G.Wan, Microelec. Eng., vol 56, 77 (2001)
- [3] H. Tu, Proc. 2nd Sino-German High Tech. Forum, p17 (2001)
- [4] Y.Y Wang, Proc. 2000 Beijing Intern Seminar Microelectron., p57 (2000)
- [5] X. T. Xu, World Electron. Devices, p7 (2001)
- [6] H.Y. Liu, Proc. 2000 Beijing Intern. Seminar Microelectron., p11 (2000)
- [7] X. P. Fan, Proc. Nation. IC Conf., p27, Shanghai (2001)
- [8] Qu Weizhi, Proc. 2000 Beijing Intern. Seminar Microelectron.,p6 (2000)
- [9] CCID Annual Report of Microelectronics, p60 (2001).

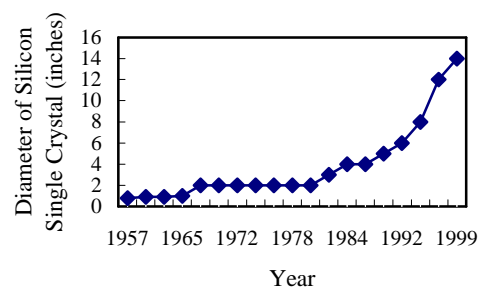


Fig. 1 CZ silicon crystals with various diameters grown in GRINM from 1957 to 1999

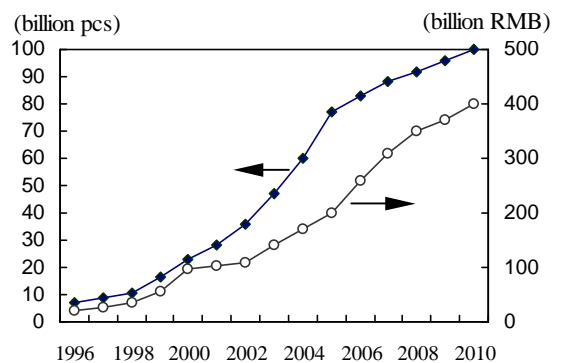


Fig. 2 Actual and forecast of China's IC market requirement from 1996 to 2010

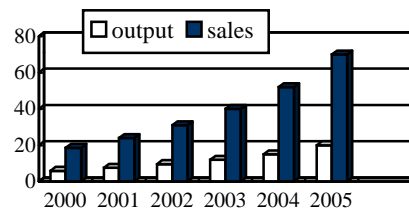


Fig. 3 Actual and forecast of China's IC production and revenue from 2000 to 2005 (Unit: billion pieces/billion RMB)