I7 (초청강연)

이종기판을 사용한 저가 태양전지용 실리콘 박막 용액 성장법
(Silicon Films Grown on Foreign Substrates for Low Cost Solar Cell Applications)

삼성종합기술원 : 이수홍, 지일환

1. Introduction

A lot of experimental work has been done polycrystalline silicon thin film on foreign substrates in order to fabricate thin film solar cells. Various substrates[1~4] have been used such as aluminium sheet, graphite, quartz, ceramics, steel and glass. Our work aims at the deposition of Si at comparatively low temperatures on sapphire, glass and quartz substrates.

2. Solution Growth Process

The solvent alloy is preapred from Al and Ga of 4N purity and 6N purity, respectively. We use an amount of 15 to 20g of solvent in each experiment. For the solution growth of silicon, metals which do not form compounds with silicon are of most interest in the present case since those that do may lead to silicide rather than pure silicon deposition from solution. These metals, with exception of Be, are arranged with the periodic table in the "extended delta" formation of Table 1. Growth takes place in a tipping boat, in which the solution-substrate contact is achieved by tipping the solvent onto the substrate. The furnace is evacuated to 10^{-6} Torr. The vacuum assists in reducing the amount of oxygen and water vapour in the tube and allows to verify that the system is leak tight. The quartz tube is filled with hydrogen purified in a palladium diffusion cell.

3. Results and Discussion

We have deposited silicon on glass, quartz and sappire substrates containing crystallites of a few 100㎛ diameter using solution growth with a 10 at% Al/Ga alloy as a solvent in the temperature range of 800℃ to 580℃. The wetting of the solvent with the substrates seems to be the most important factor that determines the grwth morphology of silicon thin films. Some areas of the Si have a (111) plane parallel to the surface of the substrate. The large grain size obtained in this study make the solution growth process very attractive for solar cell application (Fig.1).

4. References

1. J. B. McNeely, R. B. Hall, A. M. Barnett and W. A. Tiller, J. Crystal. Growth, 70 (1984) 420
2. Z. Shi, T. L. young, G. F. Zheng, M. A. Green, Solar Energy Materials and Solar Cells, 31(1993)51.
3. S. H. LEE, R. Bergmann, E. Bauser and H. J. Queisser, Materials Letters, 19(1994)1.

Table 1. "Extended delta" region in the periodic table showing metals which together with Be, do not form stable silicides.

IB	IIB	IIIA	IVA	VA	VIA
		B	C	N	O
		Al	Si	P	S
Cu	Zn	Ga	Ge	As	Se
Ag	Cd	In	Sn	Sb	Te
Au	Hg	Tl	Pb	Bi	Po

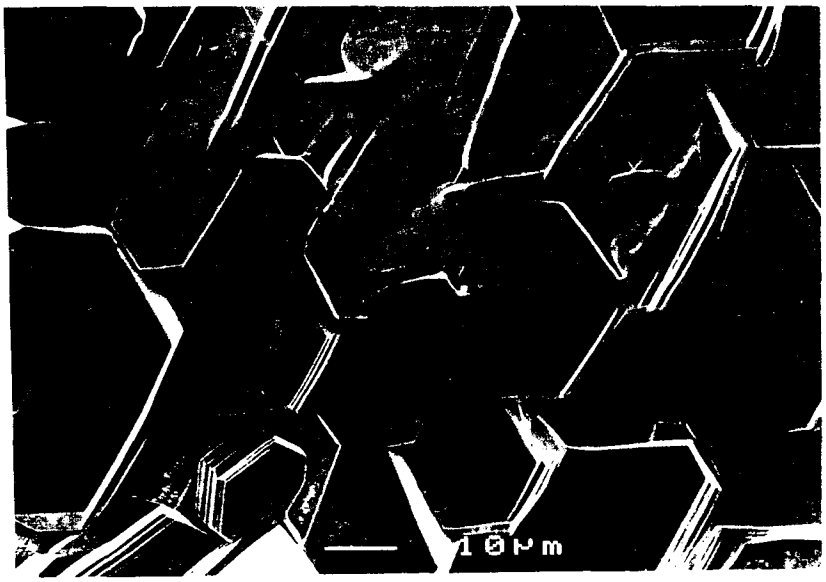

Fig. 1. The surface morphology of silicon layer on the Al-coated quartz substrates.