

Si Crystal Mirrors prepared by Plastic Deformation for Solar Cell Systems

Kazuo Nakajima^a, Kozo Fujiwara^a, Wugen Pan^a, Hiroshi Okuda^b,
^a*Institute for Materials Research, Tohoku University.* ^b*International Innovation Center, Kyoto University.* E-mail: nakajimk@imr.tohoku.ac.jp

No one has ever intentionally undertaken to obtain shaped Si crystal wafers by plastic deformation. If plastically deformed Si crystals could be freely obtained, new applications based on various creative concepts could be actively developed in a wide range of fields. In this paper, we report on the successful plastic deformation of Si crystal wafers for the preparation of wafers with various shapes. A Si wafer was set

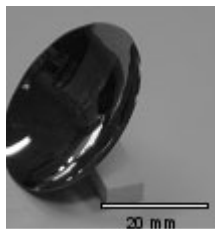


Fig. 1 A Si crystal mirror between dies and pressed at high temperatures.

One application of shaped wafers is as well-shaped concave Si crystal lenses or mirrors [1,2] as shown in Fig. 1. The lattice plane of such a crystal lens has a curvature exactly along the surface.

A new solar cell system is proposed and demonstrated with the concave Si crystal mirror used as both a solar cell and a focused mirror. The effective number of total photons is the sum of photons from both the mirror solar cell and the small cell set at the focused spot, and it determines the efficiency of the entire system. The total conversion efficiency of the present system using the focused solar beam increases to 12.2 % comparing with the conversion efficiency of 9.2 % only for the concave Si mirror solar cell. This system can make effectively use of the reflected photons from solar cells.

[1] Nakajima K., Fujiwara K., Pan W., Okuda H., *Nature Materials*, 2005, **4**, 47. [2] Nakajima K., Fujiwara K., Pan W., *Appl. Phys. Lett.*, 2004, **85**, 5896.

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