Nanostructured surfaces

Mass spectrometric analysis of surface substrates for solar cells

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To use porous silicon as both texture and antireflection coating, the porous layer is formed directly on silicon surface and along with the coating it should provide also for passivation of the photoelectric converter (PEC) surface [1]. However, results of investigations in this area [2] revealed that passivating properties of porous silicon are not sufficient to minimize surface recombination. Surfaces of multicrystalline silicon (mc-Si) Baysix substrates of porous silicon, saturated with hydrogen, used for solar cells, were studied by mass-spectrometry method.

In comparison with other methods of hydrogen saturation, the electro-chemical hydrogenation possesses several advantages. First, it can be combined with the anodizing process and will not complicate technology of the PEC. Second, it is a controlled process ensuring penetration of hydrogen atoms into a semiconductor volume at the specified depth and passivation of the broken bonds without damaging its crystal lattice.

We can compare surfaces of the mc-Si samples before and after hydrogenation in hydrofluoric acid-based electrolyte both in spectra of secondary ions and in distribution of elements by the surface (the mode of ionic microprobe and mass-spectral ionic microscope).

In this case, formed beam of primary ions scans the surface to obtain a raster pattern, mass analyzer is tuned in the mass defined, and the analyzer signal is used to modulate a monitor which sweep is synchronized with the ion beam sweep.

1. *Y.M. Huang, Q.-L. Ma, M.Meng* Porous silicon based solar cells // Materials Science Forum – 2011. - V.663-665. - P.836-839.
2. *H. Foil, M. Christophersen, J. Carstensen, G. Hasse* Formation and application of porous silicon // Materials Science and Engineering R. – 2002. - V.39. - P.93-141.