

Nanostructured surfaces

Nanostructured silicon surface made by metal-assisted chemical etching

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Since the controllable fabrication of Si nanostructures is a prerequisite for their device applications a lot of attention has been attracted to the metal-assisted chemical etching technique as a simple and low-cost method for fabricating various Si nanostructures with the ability to control such parameters as cross-sectional shape, diameter, length, orientation, doping type, and doping level [1]. Almost all procedures can be accomplished in a chemical lab without expensive equipment. Also, in contrast to VLS-based technique, metal-assisted chemical etching enables control of the orientation of Si nanostructures relative to the substrate.

In this work the metal-assisted chemical etching was carried out to produce nanostructured silicon surfaces on the basis of Si nanowire arrays what could be useful for photovoltaic application (e.g., antireflective coating).

The comparison of reflectivity measurements of Si nanowire arrays, porous silicon and polished crystalline silicon show that the textured surface of the Si nanocrystal arrays has the lowest coefficient of reflection in spectral range from 300 to 1000 nm and the absorption coefficient reaches ~ 90% with maximum in range of 400-500 nm. Moreover, visible light reflectance reaches its minimum, which is about 1.4%. This low reflectivity can be explained by three important properties of Si nanowire arrays: 1) ultra-high surface area due to the density of nanowires; 2) sub wavelength structure surface arrays of nanowires; 3) arrays of nanowires most resemble multi antireflective coating [2].

1. Chartier C., Bastide S., Levy-Clement C. Metal-Assisted Chemical Etching of Silicon in HF-H₂O₂ // *Electrochimica Acta.*-2008.-Vol.53.-P. 5509-5516.
2. Druzhinin A.A., I.P. Ostrovskii, Khoverko Yu.N., Nichkalo S.I., Berezhanskii Ye.I. Low-dimensional silicon crystals for photovoltaic cells // *Tekhnologiya i Konstruirovanie v Elektronnoi Apparature.*-2011.-Iss.5.-P. 11-13.