Investigation and characterization of nanotextured silicon surface modified by metal-assisted chemical etching technique

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The texturing of an active surface with Si nanowires (SiNW) is an alternative approach for the increasing of absorption of photoelectric converters (PEC). Due to multiple scattering of charge carriers and therefore high optical absorption in a wide range of wavelengths SiNW proved themselves as an effective absorbent layer. As it was shown previously, the J_{sc} and V_{oc} values of CVD grown SiNW [1] decreased with increasing the nanowires' height resulting in the reduction of conversion efficiency of PEC. It could be explained by the rising of surface recombination due to a large amount of dangling bonds because of nonequilibrium growth process in VLS-mechanism. Therefore, the efficiency of SiNW textured surfaces was significantly reduced in a visible range of optical spectrum. Since the visible part of the irradiation is absorbed in the surface layer of NW, the charge carriers that are generated in this region should be transferred through entire length of NW to reach the substrate where the *p-n* junction is located. This work represents the nanotextured surfaces made by metal assisted chemical etching method (MacEtch), which eliminates above mentioned drawbacks and allows creating the structurally perfect micro- and nanostructures [2]. Experimental results shown that surface nanotexturing by MacEtch technique is more efficient for creation of antireflective coatings in comparison with rough surfaces made by conventional alkaline method, and the ordered nanoporous Si surface was obtained. Such nanoporous Si surface showed a significant increasing in passing of light beams into the body of PEC. As a result – the increase in energy of photons, which enter into spatial charge region of *p-n* junction, and the improving of conversion efficiency.

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2. *Chartier C., Bastide S., Levy-Clement C.* Metal-Assisted Chemical Etching of Silicon in HF-H_2O_2 // Electrochimoca Acta.-2008.-Vol.53.-P. 5509-5516.