Solar Cell Pyramids

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Introduction: Surface texturing is a beneficial and essential step in the fabrication process of monocrystalline silicon (c-Si) and multicrystalline silicon (mc-Si) solar cells It leads to an increased front surface area and hence to larger amount of light coupled into the cell Problems/hypothesis: Increase solar cell efficiency by texturing the Si solar cell surface, and therefore increasing the absorption of sunlight. To reduce front surface reflection in Si solar cells, Procedures/methodology: Texturing: Alkaline etching has been done with KOH and IPA in water for both c- Si and pc-Si wafers Surface characterization:The surface topography was studied by means of an Agilent 5420 Atomic Force Microscope[AFM] in tapping mode Optical characterization: The optical characterization was done in the wavelength range 200-1200 nm using a Shimadzu SolidSpe-3700 Spectrophotometer with an integrating sphere Anti-Reflection Coating: After texturing characterization, a 115nm thick dry SiO2 layer Anti-Reflection Coating (ARC) was thermally grown on each sample Results:The reflectance of the (C-Si) surface is reduced to 7% after texturing and to 0.79% after adding an ARC. In (P.C- Si) the reflectance is reduced to 19% after texturing and to 4.5% after adding an anti-reflective coating. These results have a great significance on the efficiency of solar cells Conclusion: Alkaline etching of (C-Si) and (P.C- Si) wafers has been used to perform anisotropic surface texturing. A detailed study of the surface topography and reflection is carried out. It is found that minimum reflectance occurs with a KOH concentration to 1% in the etching solution, and when the texturing time is 20 min and texturing temperature is in the range 80-95oC