

Rapid Generation of Octagonal Pyramids on Silicon Wafer for Photovoltaics by Swift Anisotropic Chemical Etching Process

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Abstract : A novel octagonal upright micro-pyramid structure was generated by wet chemical anisotropic etching on a monocrystalline silicon wafer (100). The primary objectives are to reduce front surface reflectance of silicon wafers, improve wettability, enhance surface morphology, and maximize the area coverage by generated octagonal pyramids. Under rigorous control and observation, the etching process' response time was maintained precisely. The experimental outcomes show a significant decrease in the optical surface reflectance of silicon wafers, with the lowest reflectance of 8.98%, as well as enhanced surface structure, periodicity, and surface area coverage of more than 85%. The octagonal silicon pyramid was formed with a high etch rate of 0.41 $\mu\text{m}/\text{min}$ and a much shorter reaction time with the addition of hydrofluoric acid coupled with magnetic stirring (mechanical agitation) at 300 rpm.

Keywords : octagonal pyramids, rapid etching, solar cells, surface engineering, surface reflectance

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