World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:14, No:01, 2020

Nano-Texturing of Single Crystalline Silicon via Cu-Catalyzed Chemical Etching

Authors : A. A. Abaker Omer, H. B. Mohamed Balh, W. Liu, A. Abas, J. Yu, S. Li, W. Ma, W. El Kolaly, Y. Y. Ahmed Abuker

Abstract : We have discovered an important technical solution that could make new approaches in the processing of wet silicon etching, especially in the production of photovoltaic cells. During its inferior light-trapping and structural properties, the inverted pyramid structure outperforms the conventional pyramid textures and black silicone. The traditional pyramid textures and black silicon can only be accomplished with more advanced lithography, laser processing, etc. Importantly, our data demonstrate the feasibility of an inverted pyramidal structure of silicon via one-step Cu-catalyzed chemical etching (CCCE) in Cu (NO₃)₂/HF/H₂O₂/H₂O solutions. The effects of etching time and reaction temperature on surface geometry and light trapping were systematically investigated. The conclusion shows that the inverted pyramid structure has ultra-low reflectivity of ~4.2% in the wavelength of 300~1000 nm; introduce of Cu particles can significantly accelerate the dissolution of the silicon wafer. The etching and the inverted pyramid structure formation mechanism are discussed. Inverted pyramid structure with outstanding anti-reflectivity includes useful applications throughout the manufacture of semi-conductive industry-compatible solar cells, and can have significant impacts on industry colleagues and populations.

Keywords : Cu-catalyzed chemical etching, inverted pyramid nanostructured, reflection, solar cells
Conference Title : ICNSC 2020 : International Conference on Nanostructured Solar Cells
Conference Location : Dubai, United Arab Emirates
Conference Dates : January 30-31, 2020