Short Communication

Failure Behavior of Nickel Silicide Diffusion Barrier between Electroplating Cu and Textured Si Substrate

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Copper metallization has the potential to introduce into solar cell front side contact instead of screen printing. However, copper can react with silicon to form copper silicide quickly. A diffusion barrier needs to be introduced to avoid copper diffusion into the silicon substrate. Nickel silicide has been as the diffusion barrier in solar cells. The nickel silicide barrier layer also increases the adhesion strength of plated Ni/Cu. In this work, the nickel silicide barrier layer formed by electroless nickel plating method. And the degradation of the nickel silicide barrier layer in structure Cu/NiSi_x/Si will be investigated. The structures of Cu/NiSi_x/Si characterized by scanning electron microscopy (SEM), scanning transmission electron microscope (STEM), energy dispersive X-ray spectrometer (EDS), and powder X-ray diffraction (XRD). The results show that the failure of Cu/NiSi_x/Si can be attributed to copper react with nickel silicide to form Cu-Ni-Si alloy first. Then the copper penetration through the thin nickel silicide layer and the formation of copper silicide.

Keywords: Textured silicon; Nickel silicide; Solar cells; Diffusion barrier

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