During Ni/Cu plating, ghost plating is formed in the passivation layer which results in an increase of the series resistance and degradation of solar cell efficiency. In this study, in order to reduce ghost plating, Ni/Cu electrodes formation was performed under the following process conditions: Ni plating time of 1-7 min, annealing temperature of 350°C, Cu plating time of 5-7 min, pH of 6.5-7.5 and a current density of 1.6-6.4 mA/cm². As a result, the lowest leakage current and the highest current values were confirmed at the plating time of 5 min and the annealing temperature conditions were optimized at 350°C and 1 min. It was found that at lower the pH, smaller Ni and Cu particles were deposited but not uniformly. Also, it showed that at higher the pH, larger particles were deposited with lower bonding force. Uniform Ni and Cu were deposited at a pH of 6.5 and the bonding force between the electrode and the silicon substrate was good. The current density and the plating time of the Cu light-induced electroplating were varied to optimize the phenomenon of ghost plating. The highest ghost plating phenomenon was observed at a current density of 6.4 mA/cm² and a plating time of 7 min. It was confirmed that the optimized conditions without ghost plating were observed at a current density of 3.2 mA/cm² and a plating time of 5 min. The cell was fabricated after optimizing Ni plating, Ni silicide process, and light-induced electroplating. Through TLM measurement, we obtained a low contact resistance of 0.39 Ω and a current density of 42.49 mA/cm².

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