

## Environmental Pb-Free Cu Front Electrode for Si-Base Solar Cell Application

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**Abstract :** In this study, Cu paste was prepared and printed with narrow line screen printing process on polycrystalline Si solar cell which has already finished the back Al printing and deposition of double anti-reflection coatings (DARC). Then, two-step firing process was applied to sinter the front electrode and obtain the ohmic contact between front electrode and solar cell. The first step was in air atmosphere. In this process, PbO-based glass frit etched the DARC and Ag recrystallized at the surface of Si, constructing the preliminary contact. The second step was in reducing atmosphere. In this process, CuO reduced to Cu and sintered. Besides, Ag nanoparticles recrystallized in the glass layer at interface due to the interactions between H<sub>2</sub>, Ag and PbO-based glass frit and the volatility of Pb, constructing the ohmic contact between electrode and solar cell. By experiment and analysis, reaction mechanism in each stage was surmised, and it was also proven that ohmic contact and good sheet resistance for front electrode could both be obtained by applying newly-invented paste and process.

**Keywords :** front electrode, solar cell, ohmic contact, screen printing, paste

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