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Multi-pulsed flash light sintering of copper nanoparticle pastes on silicon wafer for highly-conductive copper electrodes in crystalline silicon solar cells

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Abstract

In this work, ultra-high speed flash white light (FWL) sintering method of copper nanoparticle pastes on silicon wafer substrate, was developed to produce highly conductive and low-cost copper electrodes for crystalline silicon solar cells. FWL sintering of copper nanoparticles on silicon wafer substrate has been regarded to be very difficult, due to its high thermal conductivity (k) compared with that of polymer (PI and PET) substrates. To overcome this limitation, we applied multiple pulsed FWL to sinter copper nanoparticles (Cu NPs) printed on silicon wafer. Furthermore, bimodal Cu NPs with different size were also applied to enhance the packing density of Cu films for highly conductive Cu electrodes. Finally, this work demonstrated that Cu NP-pastes are successfully sintered on crystalline silicon wafer substrate by multiple pulsed FWL irradiations.

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