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Enhancement of Efficiency in Large area Multicrystalline Silicon Solar Cells by Metallization and Texturization

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Abstract. Isotropic single step acid texturing using a combination of HF-HNO_3-CH_3COOH acids at a controlled temperature is easy, low cost and convenient option for photovoltaic industry. Grain boundary smoothening throughout the large area multicrystalline silicon (mc-Si) solar cell surface by texturization process optimization enhances cell efficiency. In the fabrication of Solar cell, metallization is an important step responsible for proper ohmic contact of the crystalline silicon cells with an efficiency more than 15%. In our present study atomic force microscope is used to observe their intragrain surface in a miniscule area of 3μm × 3μm. This AFM study of surface roughness gives a comprehensive idea of surface by the three dimensional analysis. So stainless steel (SS316) screen printing is the most suitable process for its low cost, flexibility and high productivity. In our case the exact height and width of the silver (Ag) grid fingers of both 2D screen printed cells and 3D screen printed cells are measured by an innovative Telestep equipment. In this paper the result shows a reduction of shadowing loss of 0.7% for 3DSP cells which is a welcome result for the fabrication of large area mc-Si solar cell fabrication. Again series resistance and shadowing loss minimisation result into higher efficiency of 16% in case of 3DSP cells keeping other fabrication steps the same.

Keywords. Multicrystalline silicon solar cell; HF-HNO_3-CH_3COOH texturization, AFM study, roughness and section analysis, 3D screen printing; Telestep stylus measurement;

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