Black silicon solar cells with black bus-bar strings

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Black silicon solar cells with black bus-bar strings

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** We present black silicon texturing and blackened bus-bar strings of CuO on Cu and NiZnS on solder, and with Cu, and Cu without (bare bus strings) black silicon creates all-black panels based on conventional, front-contacted Si solar cells.

** Nanostructures are fabricated by maskless reactive ion etching (RIE) using SF 6 and O 2 plasma.

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** Reflectance, black bus-bar strings

Measured reflectance as function of wavelength of bus-bar strings without (bare Cu, and Cu with solder) and with NiCuCo, NiZnS, etched solder and CuO) black coatings.

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** Reflectance, black Si

Measured total (diffuse + specular) reflectance of RIE-textured Si with SiN 3:H averaged over the wavelength range 300-1000 nm as function of the distance from the center of a 156x156 mm 2 CZ wafer.

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** CuO + adhesive glue

Current-voltage (I-V) and power measurement of two 9-cell test panels based on 100x100 mm 2 p-type CZ screen-printed black Si solar cells interconnected with (left) glued CuO coated strings and (right) soldered etched bus-bar strings.

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** I-V Results

Current (I) and voltage (V) measurements for solar panels.

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** Etched string + soldering

Current (I) and voltage (V) measurements for solar panels.

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** Industrial Application:

Inorganic, blackened bus-bar strings proposed for interconnection.

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** All-black panels from conventional, front-contacted Si solar cells

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** Conclusion

We present black silicon texturing and blackened bus-bar strings as a potential method for obtaining all-black solar panels. Black silicon results in total, average reflectance below 0.5% in the wavelength range 300-1000 nm across a 156x156 mm 2 silicon wafer. Black bus-bar strings were realized by various inorganic methods e.g. oxidized copper resulting in reflectance below 3% in the entire visible wavelength range. The combination of these two technologies results in aesthetic, all-black panels based on conventional, front-contacted silicon solar cells without compromising efficiency.