1. Motivation
Black metallic interconnects are commonly used in the integrated photovoltaic (IPV) industry to improve the aesthetics. In this work, we investigate the stability of black metallic ribbons for IPV applications and the effect of an unstable ink in solar cell mini modules.

3. Experimental
4 black colored ribbons are encapsulated in G/Bs configuration. The samples are subjected to light exposure according to existing IEC standards [1]:
- UV exposure \( \rightarrow \) IEC 62788-7-2 A3 [2]
- Chamber air temperature: 65°C
- Relative humidity: 20%
- Lamp source Xe-arc lamp (with daylight filter)

One unstable ink is studied further by degrading its main component.

5. Results
5.1 Image processing

5.1.1 Sample #1
- 0 kWh/m²
- 120 kWh/m²
- Color change
- Halo effect ΔE=5 in the encapsulant
- Image processing

5.1.2 Sample #2
- 0 kWh/m²
- 120 kWh/m²
- Color change
- Image processing

5.1.3 Sample #3
- 0 kWh/m²
- 120 kWh/m²
- Color change
- No color change ΔE=5
- Image processing

5.1.4 Sample #4
- 0 kWh/m²
- 120 kWh/m²
- Color change
- No color change ΔE=5
- Image processing

5.2 Ink component isolation
The main component of ink #1 is:
- 2-Phenoxyethyl acrylate (2-PEA)

5.3 Impact of degraded ink #1 on module performance

5.4 Module on UV without ink

Conclusions
- We investigated the stability of black metallic interconnects in G/Bs configuration.
- We followed a protocol of light exposure according to already existing IEC standards.
- A change in color was observed in all the black metallic interconnects with UV curable inks no matter of the configuration used (EVA or POE, with and without UV blockers).
- Acrylates degradation of main ink components may be the cause of the color change.
- UV blocker encapsulants do not mitigate the degradation.
- Commercial black metallic interconnects are stable under UV light exposure after 120 kWh/m².
- The consequence of using the wrong ink would be mainly aesthetical, performance is only slightly affected.
- Further activities involve the understanding of the degradation mechanisms causing the color change.

References

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