# $CuGaO_2$ a promising alternative for NiO in p-type dye solar cells

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## Experimental details

*Electrochemical impedance spectroscopy (EIS) measurements.*

Pellets for electrochemical impedance spectroscopy (EIS) measurements were formed from $CuGaO_2$ nanoparticles pressed under 100 bars and sintered at 450°C for 3 hours in nitrogen atmosphere. The back side was painted with a silver glue and contacted with copper coil before being mounted in a polypropylene tube using chemically resistant epoxy. EIS measurements were carried out with a potentiostat/galvanostat model VSP from Biologic Sciences Instruments on polished samples (used SiC-Paper, grit 1200 and 4000 (Struers)) in an electrolyte composed of 1 M $LiClO_4$ in water (pH ~ 6.3) with a platinum counter-electrode and a saturated calomel reference electrode (SCE).

*Prepration of the $CuGaO_2$ photocathode.*

The doctor Blade paste is composed of $CuGaO_2$ nanoparticles ball milled in an adapted mixture of organic ingredients to have a suitable rheology to homogeneously spread $CuGaO_2$ on FTO (Solems 10 Ohm TEC7) (see table S1).

**Table S1**. Detailed composition of the paste for doctor blading.

| | Component | Quantity |
|---|---|---|
| **Semiconductor** | $CuGaO_2$ | 100 mg |
| **Binder** | PEG 300 (Aldrich) | 20.5 mg |
| **Rheological agent** | Ethylcellulose (Aldrich) | 4 mg |
| **Acidifying agent** | 4-hydrobenzoic acid (Merck) | 2 mg |
| **Solvant** | 2-ethyl-1-hexanol (Aldrich) | 750 µL |

The as-obtained electrodes were then dipped at room temperature for 48 hours into an acetonitrile solution, containing either perylene monoimide (PMI) or perylene monoimide sensitizer connected to a naphtalene diimine electron acceptor (dyad PMI-NDI). The dyed electrodes were thoroughly rinsed with acetonitrile.

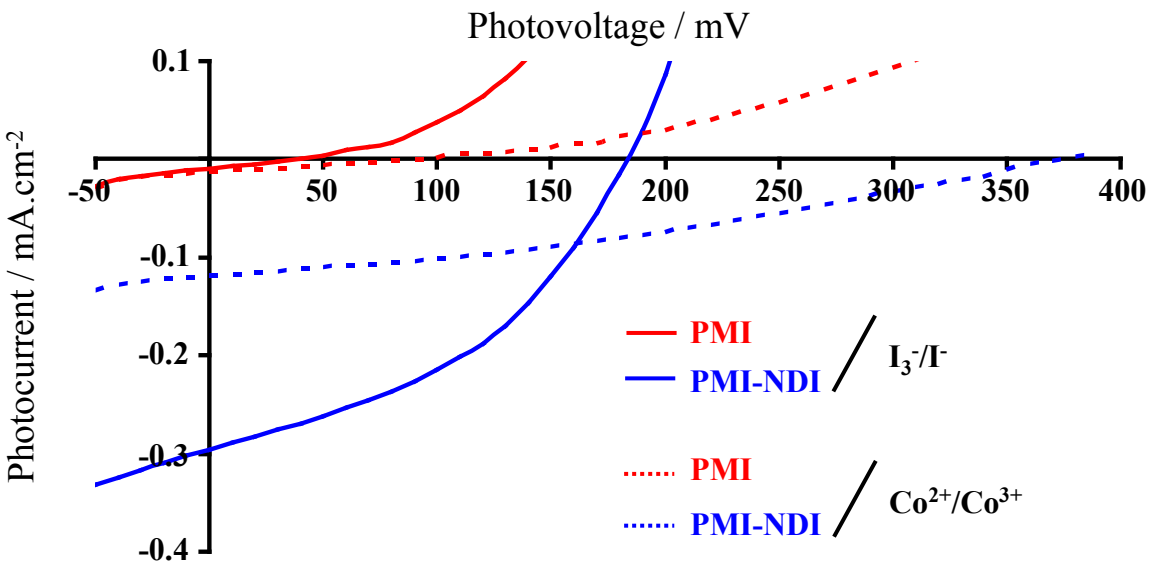


**Fig. S1.** Photoresponse under AM1.5 illumination (1000 W/m$^2$) of solar cells constructed from $CuGaO_2$ p-SC with dyad PMI-NDI or PMI as sensitizer, and $I^-/I_3^-$ or $Co^{2+}/Co^{3+}$ in PC as redox mediator.