DEPARTAMENTO DE FÍSICA FUNDAMENTAL

# Shaping and understanding Cu(In,Ga)Se2 solar cells: from nanometers to GigaWatts

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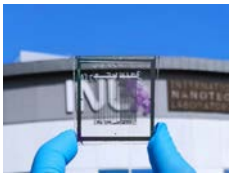
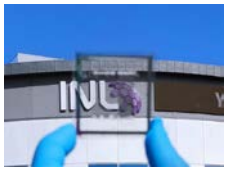
Climate change is a critical challenge for humanity. The transition to a clean energy system is urgent, and the direct conversion of solar energy into electricity through photovoltaics (PV) is considered the most suitable response to this challenge. Currently, the market is dominated by crystalline silicon PV technology. Nevertheless, thin-film PV provides advantages for specific applications, e.g. in building-integrated PV. The thin-film PV technology based on Cu(In,Ga)$Se_2$ (CIGSe) absorber layers has demonstrated competitive power conversion efficiencies above 23%. Their properties and deposition processes enable the fabrication of light-weight, flexible, and semi-transparent modules.
Specifically, semi-transparent solar cells have attracted massive interest in the photovoltaic industry as they allow the integration of photovoltaics in buildings, e.g. as windows. Typically, semi-transparency is achieved by fabrication of ultra-thin CIGSe absorbers on see-through transparent back contacts. However, this approach leads to poor performance and unpleasant (colored) visual appearance. We are developing an alternative approach consisting of micro-patterning a full-thickness solar cell, giving it the semi-transparent characteristic. Proof-of-concept semi-transparent CIGSe solar cells were fabricated by chemically etching a full solar cell, leading to spatially-segmented micro-sized line-shaped solar cells, invisible to the human eye at practical distances. By varying the lines' width and spacing, it is possible to control the window's average visual transparency (AVT), making it suitable for different applications.

[1] P. Santos, P. Anacleto, D. Brito, S. Shital, A. Debot, P.J. Dale, S. Sadewasser, Thin Solid Films 770, 139778 (2023).

[2] N. Nicoara, R. Manaligod, P. Jackson, D. Hariskos, W. Witte, G. Sozzi, R. Menozzi, and S. Sadewasser, Nature Commun. 10, 3980 (2019).

[3] D. Sharma, N. Nicoara, P. Jackson, D. Hariskos, W. Witte, and S. Sadewasser, submitted (2023).





**Día: Jueves, 6 de julio de 2023**
**Hora: 12:00 horas**
**Lugar: Áula VII (Trilingüe)**