Silicon Micropillars covered by $CuInSe_2$ for photovoltaic applications

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$CuInSe_2$ (CIS) it is currently among the most important thin film photovoltaic materials because its absorption coefficient (~ 10^5 cm^{-1}). It can absorb more than 90% of solar radiation in thickness of around 2 μm [1]. However, if it is deposited on flat substrates, efficiency losses occur due to reflection (Fig 1a). This work proposes the deposition of CIS on silicon microstructures (Si MS) by electrochemical deposition (Fig 1b). In order to increase the surface area of this material.

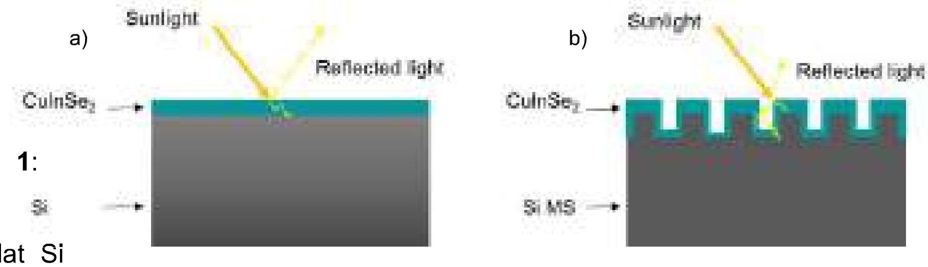

Figure 1: Reflection paths of CIS films deposited on a) flat Si b) Si micropillars.

A photolithography process is performed to define a quadratic pattern of circles of photoresist of 136μm in diameter on Si (Fig 2a). Subsequently, the exposed Si surface was etched by metal-assisted chemical etching producing pillars (Fig 2b). The $CuInSe_2$ was grown by electrochemical deposition on the microstructured Si substrates (Fig 2c).

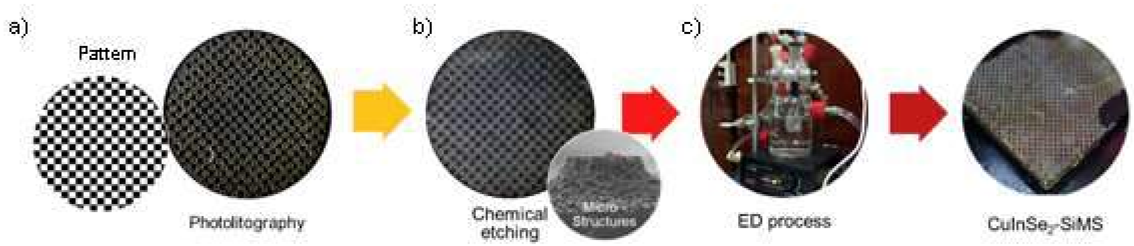

Figure 2: Methodology to produce Si micropillars covered with $CuInSe_2$.

SEM images and Raman results showed that nanostructured $CuInSe_2$ was formed around and on top of silicon micropillars. The decreased light reflection was confirmed by specular reflectance spectroscopy.

References

[1] S. De La Luz-Merino, M. E. Calixto, A. Méndez-Blas, *Materials Chemistry and Physics,* 1**63** (2015), 362-368.

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