

Low cost Processing of III-V solar cells

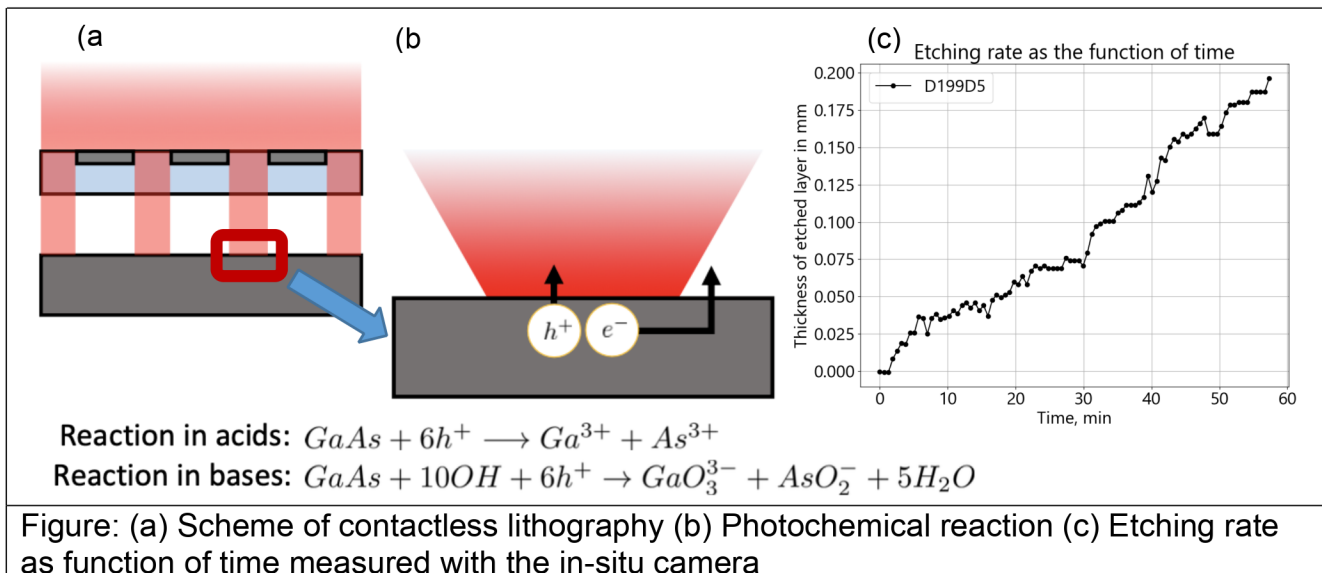
Oleh Ivashtenko,¹ Maxime Levillayer,² Sylvain Finot,² Stéphane Collin^{1,2}, Jerónimo Buencuerpo¹

¹ Palaiseau, France, Centre de Nanosciences and Nanotechnologies (C2N), CNRS, Paris-Saclay University, Palaiseau, France, ² Institut Photovoltaïque d'Ile-de-France (IPVF), Palaiseau.

The efficiency of a single-junction solar cell is limited to 33% [1]. A potential way to overcome this limit is through the use of tandem solar cells. One of the possible materials for combining with silicon is III-V materials, which have demonstrated the best efficiency for hybrid tandems on silicon (36.1%) [2]. However, the production cost of III-V cells is much higher than that of silicon, mainly due to the cost of the substrate and processing techniques[3].

Here, we investigate low-cost processes using photochemical etching of GaAs and AlGaAs for device definition (mesa). The etching of GaAs and AlGaAs layers is performed in nitric acid using a developed etching LED setup with in-situ monitoring and control. Further video analysis is conducted to investigate potential limitations of the method.

We observe etching of GaAs and AlGaAs layers in AlGaAs/GaAs structures. We achieved etching rates of 0.2 mm/h.



[1] W. Shockley and H. J. Queisser. Journal of applied physics, 32(3):510–519, 1961.

[2] Schygulla, Patrick, et al. Progress in Photovoltaics: Research and Applications (2024).

[3] Ward et al. Progress in Photovoltaics: Research & Applications (2016).