Production of an Interdigitated Back Contact (IBC) Solar Cell with ultra-thin crystalline Silicon layer

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A very innovative approach has been implemented for the realization of an Interdigitated Back Contacted (IBC) solar cell to be applied to ultra-thin c-Si substrates. The objective is to study the potentialities of c-Si ultra-thin substrates in combination with the IBC architecture, in order to reduce the cost of the final device. Fabrication process starts with the deposition of aluminum oxide/silicon carbide (Al_2O_3/SiCx) layer for surface passivation. Next, sample is glued onto a glass which grants access to the rear surface for contact definition. The rear dielectric is locally opened through lithography followed by a film stack deposition consisting of a-SiCx (i) for passivation, a-Si (n) for doping and SiCx for chemical protection to avoid any lifetime deterioration during the subsequent chemical steps. After a second lithography that locally opens the dielectric, we deposited a vanadium oxide (VOx) as Hole Transport Layer (HTL) [1] and the ITO. Finally, laser doping was used to create n+ regions that work as electron selective contacts and the metal contacts are evaporated.
Up to now, this technology has been tested onto 40 μm-thick c-Si substrates with promising results of 11.1 % and on Liquid Phase Crystallized substrates of 6.8 μm leading to efficiencies of 4.8 % [2]. In future works, we are planning to improve this technology and apply it on substrates obtained by c-Si exfoliation by hydrogen implantation.

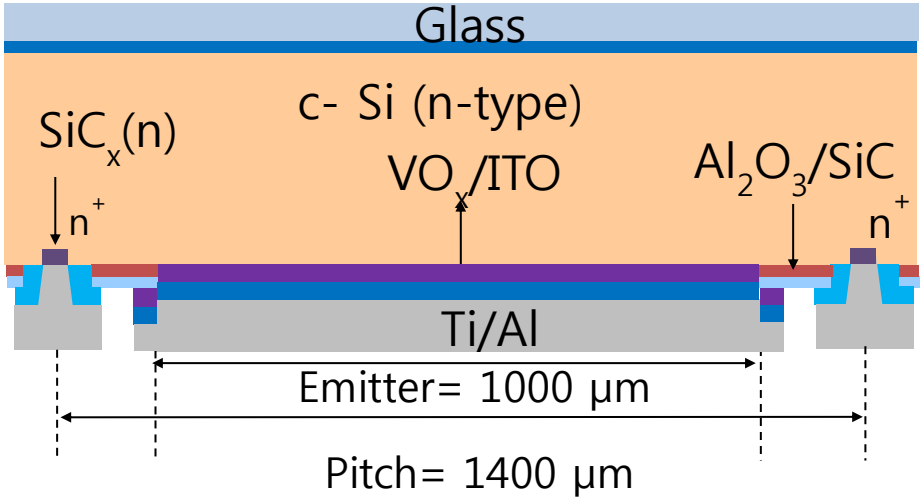

Fig : IBC Solar Cell

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2- Isidro Martín, Gema López, Jonathan Plentz, Chen Jin, Pablo Ortega, Cristóbal Voz, Joaquim Puigdollers, Annett Gawlik, Guobin Jia, Gudrun Andrä, Multicrystalline Silicon Thin-Film Solar Cells Based on Vanadium Oxide Heterojunction and Laser-Doped Contacts, accepted in Physica Status Solidi A. DOI: 10.1002/pssa.201900393