



Imec Demonstrates Large Area Industrial Crystalline Silicon n-PERT Solar Cell with a Record 22 Percent Efficiency

Leuven (Belgium)—Jan. 15, 2015—Nano-electronics research center imec announced today that it has improved its large area n-type PERT (passivated emitter, rear totally diffused) crystalline silicon (Si) solar cell on 6" commercially available n-type Cz-Si wafers, now reaching a top conversion efficiency of 22.02 percent (calibrated at ISE Callab). This is the highest efficiency achieved for this type of 2-side-contacted solar cell on an industrial large area wafer size.

Compared to p-type silicon solar cells, n-type cells do not suffer from light induced degradation and feature a higher tolerance to common metal impurities. As a result, n-type silicon solar cells are considered as promising alternatives to p-type solar cells for next generation highly efficient solar cells.

Looking into increasing the conversion efficiency of its large-area n-PERT silicon cells using advanced industrial processes, imec has further improved the conversion efficiency of its n-PERT solar cell, reaching a record 22 percent, featuring an open-circuit voltage (V_{oc}) of 684mV, a short-circuit current (J_{sc}) of 39.9 mA/cm², and 80.7 percent fill factor (FF). Efficiency improvements were obtained by the introduction of a selective front surface field through laser doping, giving a boost in open circuit voltage and short circuit current.

"Our new developments, resulting in additional improvement of the conversion efficiency, further confirm the potential of n-type PERT cells for next-generation highly efficient silicon solar cells" said Filip Duerinckx, manager of imec's n-PERT technology platform. "This new efficiency record has been achieved while simultaneously simplifying the process, relying only on simplified cleans and without any expensive Forming Gas Anneal (FGA). We are committed to further increasing the efficiency of this cell concept and adding to the industrial value of the technology. This will enable bringing this technology to the market in short term."

Imec's n-PERT silicon solar cells feature Ni/Cu/Ag front contacts, applied using an industrial plating tool from Meco, and rear local contacts obtained by laser ablation of the rear passivation stack and subsequent metallization. The rear passivation stack includes a thin (<10 nm) Atomic-Layer-Deposited (ALD) Al₂O₃ layer, deposited with the spatial ALD technique InPassion Lab® from SoLayTec. The diffused Front Surface Field (FSF) and rear emitter as well as the Anti-Reflective Coating (ARC) are applied in a Tempress batch-type furnace. These results have been



achieved in the framework of the imec's industrial affiliation program on advanced silicon solar cells, dedicated to developing high performance and low cost Si PV-technologies. In this program, imec works closely together with industrial and academic partners along the solar cell value chain. Via participation and contribution to this program, these partners support imec's developments and obtain early access to new technology solutions in this way accelerating their own product development.

This press release can be downloaded at http://www2.imec.be/be_en/press/imec-news/imec-22-percent-nPERT-solar-cell.html

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About imec

Imec performs world-leading research in nanoelectronics and photovoltaics. Imec leverages its scientific knowledge with the innovative power of its global partnerships in ICT, healthcare and energy. Imec delivers industry-relevant technology solutions. In a unique high-tech environment, its international top talent is committed to providing the building blocks for a better life in a sustainable society. Imec is headquartered in Leuven, Belgium, and has offices in the Netherlands, Taiwan, US, China, India and Japan. Its staff of over 2,080 people includes more than 670 industrial residents and guest researchers. In 2013, imec's revenue (P&L) totaled 332 million euro. Further information on imec can be found at www.imec.be. Stay up to date about what's happening at imec with the monthly imec magazine, available for tablets and smartphones (as an app for [iOS](#) and [Android](#)), or via the website www.imec.be/imecmagazine

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