PRIMA

Small or medium-scale focused research project

SEVENTH FRAMEWORK PROGRAMME

THEME FP7-ICT-2009-4

INFORMATION SOCIETY TECHNOLOGIES

Deliverable 6.6 – Press release summarizing the final project results

Contract no.:	248154
Project acronym:	PRIMA
Project full title:	Plasmon Resonance for IMproving the Absorption of solar cells
Project website:	http://www.prima-ict.eu

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Document revision history

Version	Date	Author	Summary of main changes
1	12/02/13	B.P. Rand	Final version

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1 Final press release

The final public press release, to be performed by imec, is expected to be completed on 25/02/2013, nicely in line with the final review meeting on 27/02/2013. This press release will overview the highlights of the project. The press release is anticipated to have the form given in the next section.

2 Text of press release

European collaboration sheds light on plasmonic enhancement of solar cell efficiency

Leuven - February 25, 2013 – Imec, together with its project partners, have cooperated within an EU 7th framework program (FP7) project PRIMA to improve both the efficiency and cost of solar cells. In particular, they have worked on a light trapping strategy utilizing metal nanostructures that allows plasmons to increase the absorption within the solar cell structure.

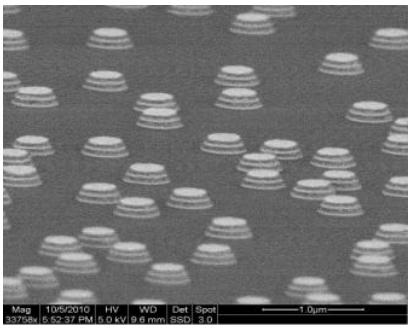
Nanostructured metals can absorb and intensify light at specific wavelengths. This phenomenon, called plasmonics, has many promising applications: it may be exploited to transmit optical signals through nanosized interconnects on chips, in nanoparticles that recognize and interact with biomolecules, or in solar cells, to increase the light absorption in the cell's photoactive material, paving the way toward thinner and therefore less expensive energy generation. During the course of the European FP7 PRIMA project, imec and its project partners Imperial College (London, UK), Chalmers University of Technology (Sweden), Photovoltech (Belgium), Quantasol (UK), Azur Space Solar Power (Germany), and Australian National University (Australia) gained essential knowledge in the use of metal nanoparticles to enhance solar cell efficiency.

One of the project achievements was the development and demonstration of a method to fabricate organic solar cells with a plasmonic nanostructured silver (Ag) rear electrode using hole-mask colloidal lithography (HCL). This a low-cost, bottom up and extremely versatile technique was shown to be compatible with the fragile organic semiconductors located underneath. The introduction of a plasmonic nanostructured Ag rear electrode resulted in an efficiency enhancement of more than twofold in the absorption tail.

With respect to wafer-based solar cells such as those based upon silicon, our results indicate that to enhance solar cell efficiency, plasmonic structures need to be integrated on the back side of the solar cells, and not on the front side. Ag nanodiscs on the front side dielectric antireflection coating (ARC) of silicon-based solar cells resulted in an improved light absorption but no efficiency increase, due to parasitic absorption in the nanoparticles and destructive interferences. Moreover, we were able to tune nanostructures on Si solar cells to optimize the light absorption in the photovoltaic layer under a given illumination.

A 3D simulation tool was developed, accurately modelling both optical and electrical characteristics of solar cell devices incorporating plasmonic nanostructures. The model indicated that gold or silver nanoparticles can enhance solar cell efficiencies at certain wavelengths, while at other wavelengths, the solar cell performance degrades. Aluminum nanostructures, on the other hand, can enhance the efficiency over the entire relevant spectral region of a solar cell due to their intrinsically low light absorption and strong scattering, as demonstrated on plasmonic GaAs solar cells.

For more information, please see www.prima-ict.eu/



Scanning electron micrograph of nanostructured features capable of redirecting light to where it can be more effectively utilized.