Bundesministerium für Bildung und Forschung

Photonics Research Germany

Transnational funding initiative – “intensification of cooperation with Greece: sponsoring of German-Greek research projects”

Project:	**Nanostructured plasmonic reflectors for thin-film solar cells (SolarNano)**
Coordinator:	Prof. Dr. Thomas Pertsch Institute of Applied Physics Friedrich Schiller University Jena Max-Wien-Platz 1 07743 Jena Tel.: +49 3641 947840 thomas.pertsch@uni-jena.de
Project volume:	Total of € 650,900 (German share € 432,900, of which approx. 76% share of funding from BMBF – German Federal Ministry of Education and Research)
Project duration:	01.07.2014 to 30.06.2016
Project partners:	➲ Friedrich Schiller University, Jena ➲ JCMwave GmbH, Berlin ➲ FORTH Foundation for Research and Technology Hellas, Heraklion (Greece)

Bilateral research cooperation within Europe – an important element of national research policy

To further expand the German-Greek partnership initiative of 5th March 2010, the German Federal Ministry of Education and Research (BMBF) and the General Secretariat for Research and Technology (GSRT) in the Ministry of Education and Religious Affairs, Culture and Sports of the Hellenic Republic plan to continue their research dialogue together and to intensify their support for bilateral research projects.

MINISTRY OF EDUCATION, LIFELONG LEARNING AND RELIGIOUS AFFAIRS
GENERAL SECRETARIAT FOR RESEARCH AND TECHNOLOGY

Bundesministerium für Bildung und Forschung

This is where this funding measure is applied. It should serve as an incentive to universities, non-university research institutions and companies in trade and industry to develop joint projects with partners from Germany and Greece according to their scientific strengths and problem-solving skills. The funds should allow interested universities, research institutions and companies in trade and industry to develop and implement viable cooperation models for R&D activities between German and Greek institutions.

By funding joint research projects, the existing potential for scientific and technological cooperation in the countries should be utilised. With funding for German-Greek partnerships and specific and innovative research areas, new stimuli should be provided, which should result in improved R&D relationships between the partners. Furthermore, as a result, the cooperation of German and Greek representatives from science and industry in particular should also be expanded in joint projects. In the medium and long term, this should improve global competitiveness and strengthen co-operation both between research institutions and with industrial partners. In total, seven technology fields are being sponsored.

Resource-saving highly efficient solar cells

Silicon-based thin-film solar cells are a promising technology for resource-saving and cost-effective energy production. They are therefore a key technology for solving major questions of the future, e.g. such as securing the resource autonomy of Europe and limiting climate change.

The aim of the project is to significantly improve this technology by increasing light absorption. This is possible as the efficiency of solar cells today is limited to a significant extent by their optical imperfection. This means that a large proportion of the incident sunlight is not fully converted into electrical energy in solar cells today due to parasitic processes or incomplete absorption. There is huge potential here for improving solar cells. However, the reduction of such losses is inescapable in order to ultimately ensure the future success of photovoltaics and to provide a solution for the social duty to stop climate change.

SolarNano – nanostructured plasmonic reflectors for thin-film solar cells

The aim of the SolarNano network is to improve the efficiency of solar cells using optical nanostructures, taking into account economic aspects and the use of resources. The starting point here is the latest silicon thin-film solar cells, which already have nanostructured materials although their optical effect has not yet been fully understood and exploited.

The analyses focus on stimulating so-called plasmon polaritons on nanostructured metallic boundary surfaces that are already part of many solar cells but have so far not been usable to optimise the efficiency of solar cells. The approach pursued by the SolarNano network in order to improve system efficiency therefore displays high optimisation potential that is cost/resource-neutral. The reason why attempts were actually made to avoid stimulating plasmon polaritons in previous solar cells can be found in the fact that complete understanding of the stimulation of plasmon polaritons was impossible due to a lack of theoretical methods and that it was necessary to avoid their potential contribution to losses. However, their effect as a highly efficient light concentrator within the solar cell offers enormous potential for improvement.

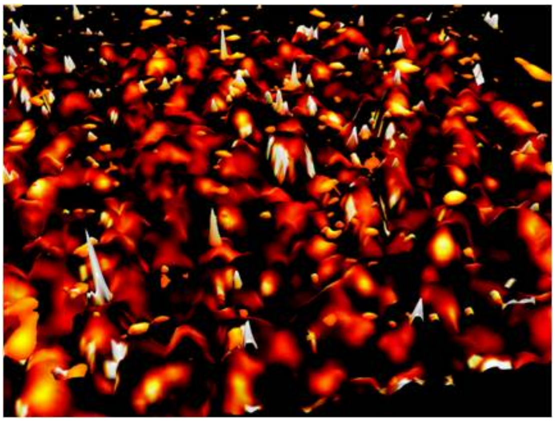

Image 2: Computer simulation of the light concentration inside a solar cell, which can be controlled with nanostructured surfaces (source: FSU Jena).

One essential working point of the SolarNano network therefore lies in the development of computerised models with which optical effects on structured metallic boundary surfaces can be described. To this end, in the SolarNano network, university research scientists are working hand-in-hand with developers from the software industry to create efficient design tools for the next generation of solar cells. Ultimately, state-of-the-art solar cells will be optimised on the basis of these tools. Specific properties and framework conditions of practice-based production processes must be taken into account here in order to allow resource-saving adaption of industrial production processes to the new solar cell systems.