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Newsletter November | ADEM is the Advanced Dutch Energy Materials Innovation Lab. ADEM performs fundamental materials research for new sustainable energy technologies. In ADEM, ECN and the universities of technology of Delft, Eindhoven, and Twente have joined forces to create an open community, open innovation lab. ADEM targets its joint expertise and technological infrastructure to the most pressing energy challenges. Together with industry, ADEM catalyses research, strengthens the Dutch knowledge economy, and supports industrial innovations towards sustainable energy technologies. www.adem-innovationlab.nl

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We're ADEM

Early 2009 the Dutch government recognized the new collaboration as essential part of its Energy Innovation Agenda and invested 30 million euro. Half of these funds will be spent on science projects and with it on the training of young talents, half on new research facilities. "To achieve a sustainable energy future, we can't depend on any single specific energy technology," says Wim Sinke, director of ADEM. "We need to develop a range of approaches to sustainable energy. And each depends on material innovations."

The Netherlands has an excellent track record in materials research. "With ADEM we have the opportunity to strengthen our place in the sustainable economy of the future." For example by supporting industrial innovations towards sustainable energy technologies or by creating public - private partnerships. Research conducted by ADEM will focus on six themes: (I) Catalysts, membranes and separations, (II) Batteries, (III) Hydrogen production and fuel cells, (IV) Wind energy, (V) Transport, transfer and storage of heat, and (VI) Solar cells and modules.

For more information please contact: pmo@adem-innovationlab.nl

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Read all about Energy Materials Innovations

The ADEM website is portal to the innovation lab.
Go to www.adem-innovationlab.nl for information about ADEM expertise, infrastructure and research highlights.

Mechanical aspects of solar cells

As a material and mechanical engineering expert, TU Delft's Vera Popovich partly performs her research at ECN. 'I'd say ECN is really my industry partner. It's where I can test my ideas in a real life solar cell production line'. Her ADEM PhD-project focuses on the mechanical aspects of crystalline silicon solar cells, the ones that account for some 80% of global PV-production volume. Studying the mechanical integrity of solar cells is a new field of research. 'By understanding the mechanisms and by being able to predict defects and stresses that occur during production processes' Vera explains. 'We can now start optimizing the different steps in the production of solar cells such as the cutting process, firing of metallic contacts (Al and Ag contacts) and soldering process.' This optimization, results in a reduction of residual stresses and micro cracks in the actual solar cell. And in turn, this will not only lower production losses due to breakage and therefore decrease overall production cost, it will also increase electrical performance and life time of the solar cells produced.

Vera's results are very promising indeed and hold great potential for industry. Moreover, her work on defect detection and non-destructive characterization techniques such as X-ray computed tomography, microwave photoconductivity decay (μ-PCD), light beam induced current and electroluminescence imaging is crucial in giving detailed information about the cell's state. It is easy to see why her work has attracted a lot of attention from academia all around the world. Vera concludes: "I now have regular international meetings with, for instance, US scientists and German colleagues from ISE Fraunhofer. It's really pretty exciting!"

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Nanocomposites for wind turbines

At TU Delft, PhD students Julie Teuwen and Natcha Chamnandechakun develop novel composites for application in the blades of wind turbines. "These turbines can only get larger if we achieve blades with improved mechanical and structural properties," says Teuwen. An important step is to improve the skins of the blades, normally created using thermoset resins, which solidify irreversibly during processing. "We'd like to replace these resins by thermoplastic resins, which are easier to assemble, easier to form, cheap, can be re-used and have similar or even better mechanical properties." Luckily, the regular process steps used for thermoset resins can be used for the thermoplastics tested in Delft as well.

Chamnandechakun adds: "Material improvements are needed to make the thermoplastic skins withstand moisture better." So, as part of the ADEM programme, three-phase nanocomposites are currently being developed, consisting of a thermoplastic matrix, continuous fibres and carbon nanofibres. "We're still in the testing phase of this composite, but this material approach could be a holy grail for wind turbines." The composites have the potential to significantly enhance the operational range and lifetime of the turbines while limiting cost increases.

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Industrial participation

From the onset, interest from industrial parties in the ADEM collaboration has been high. During the ADEM proposal phase, various industries submitted letters of intent totaling over 6 million Euro's. Such level of support in a time of financial hardship highlights the interest of companies to join the sustainable economy of the future, and the enabling role of ADEM in this context. Sustainable energy technologies are global opportunities, and this is reflected in the very international scope of the R€D partnerships of the ADEM participants. ADEM welcomes industrial partners from all over the world to join ADEM and tap in on the high concentration of materials expertise it represents.

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