



Chemistry will be
invaluable to future
energy research

Prof. René Janssen and Dr Anja Bieberle, who research solar fuels together at NWO's new institute DIFFER, share their ideas about the role of chemistry in developing sustainable energy.

Energy research is the central theme of the NWO's new institute DIFFER (Dutch Institute for Fundamental Energy Research). DIFFER is financed by NWO and supplemented with national and European project funding and industrial funding.

The leader of one new group within DIFFER is René Janssen, professor of physical organic chemistry at the Eindhoven University of Technology. He recently started cooperating with Dr Anja Bieberle, a specialist in thin-film materials and microfabrication for energy applications. She joined DIFFER earlier this year, as a tenure-track group leader for photoelectrochemical solar fuel conversion.

Janssen: Our main focus is converting solar energy into chemical energy, in a form that can be stored and used wherever you need it. Conventional solar panels turn sunlight into electricity, but storing that electricity remains a challenge.

Bieberle: Electricity is currently stored in batteries, but those have severe limitations. They are certainly not the most efficient strategy.

Janssen: And if we really want solar and wind energy to take off, we need to solve the challenge of energy storage. After all, wind and sun don't have a constant output. Our aim is to store the energy in the form of chemical bonds, using materials that are stable, abundant and environmentally friendly. One example is the use of sunlight to split water into hydrogen and oxygen, and to transfer the energy further to hydrocarbons, which can be stored well.

Bieberle: This is truly a multidisciplinary field: chemistry, physics, engineering... That makes it incredibly fascinating. We actually operate on the interface between chemistry and physics, which illustrates that DIFFER, originating from the former FOM Institute Rijnhuizen, is now a real multidisciplinary NWO institute.

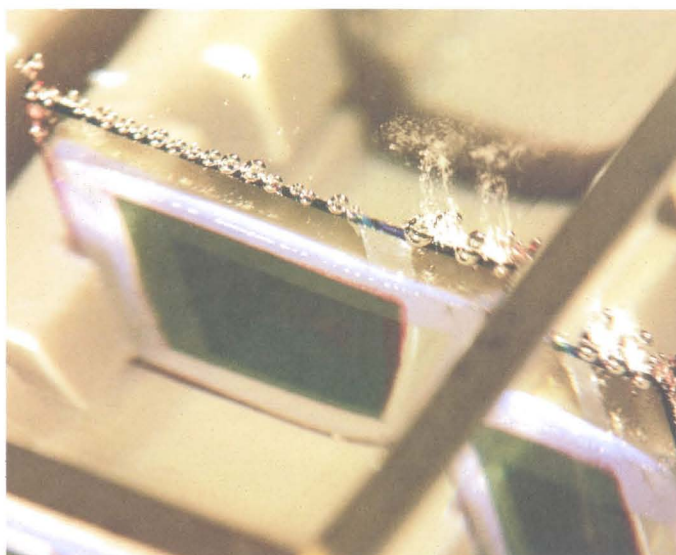
Janssen: We work on the smallest molecular scale, looking for instance at what happens at the surface of a catalyst. Although we have clear applications in mind, many fundamental problems have yet to be solved.

Bieberle: But for me, fundamental research is always done with applications in mind.

Janssen: Yes, for me it's the same. But if you are digging this deep into the details, you are also bound to find joy in the science behind it.

Bieberle: What's also motivating for me is the simple fact that we really have to move forward in energy research. We cannot just go on like we did in the past, relying almost exclusively on fossil fuels. If the problem becomes urgent enough, there will be more and more pressure to develop sustainable alternatives, and better solutions will be found – and very likely in our field, too. I am actually quite optimistic.

Janssen: You have to be optimistic. It is the only way forward. Finding new sources of renewable energy and ways to store it will be the main challenge of this century. It will be tough, but not unsolvable. And I am sure that DIFFER will be able to make a difference there.



An artificial leaf based on organic semiconductors splits water into hydrogen and oxygen when illuminated with light. Photo: Bart van Overbeeke.