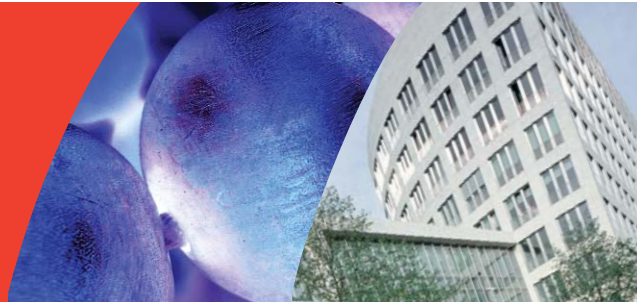

"Green" hydrogen from renewables

Project details	
Project title	Development and pilot plant demonstration of hydrogen production from solar energy and biomass (waste) compounds and derivatives at ambient conditions mediated by nano-structured photocatalysts
Participants	University of Nottingham, UK University of Patras, Greece

A green, innovative, cost-effective and energy-effective means of hydrogen production from renewables is being developed and demonstrated under E.ON's International Research Initiative.

The new process, which combines solar driven cleavage of water and degradation of organic compounds, will be able to produce hydrogen fuel at ambient conditions with the use of three abundant and renewable sources: solar light, biomass and water.

Energy from the sun will be collected through a nano-structured photocatalyst and used in a photoreactor to release hydrogen from the mixtures of biomass and water.

This approach is a move to produce hydrogen on an environmentally-friendly and cost-effective basis, avoiding energy derived from fossil fuels and CO_2 emissions. It needs only readily available resources – solar energy, water and biomass material which includes raw waste that otherwise might not be used.

The project has been put forward by the University of Nottingham, UK, and the University of Patras, Greece, and involves three of the universities' research laboratories specializing in photocatalysts and photoreactors.

The academics taking part are Dr Gianluca Li Puma, an associate professor in the Department of Chemical and Environmental Engineering at Nottingham and, at Patras, Dr Dimitris Kondarides, an assistant professor in the Department of Chemical Engineering; Dr Panagiotis Lianos, a professor in the Engineering Science Department; and Dr Xenophon Verykios, a professor in the Department of Chemical Engineering.

The idea to combine solar driven water splitting – which produces relatively small volumes of hydrogen – with the oxidation of biomass material follows a recent breakthrough by the University of Patras.

Researchers discovered the feasibility of obtaining hydrogen by irradiation of solutions of organic compounds. These include surplus product and waste from biomass processing industries, and biomass components.

The investigators found the potential for nano-structured photocatalysts to be used to stimulate the biomass degradation process. Importantly, they showed that the process could take place at ambient conditions, without the need for extra heat.

Their findings confirmed that the hydrogen yield could be up to 100 times greater than when the same photocatalytic technique was used for conventional water splitting.

The E.ON IRI project is now concentrating on innovating photocatalytic materials with strong light absorption characteristics. These will form part of nano-structured

semiconductor-based photocatalysts to be incorporated in efficient solar photoreactors for the generation of green hydrogen.

Identification of the best materials and the most efficient reactor configurations will be key parts of the program. The hydrogen production concept will be developed and evaluated in both bench and pilot scale plant.

This project could contribute to meeting the forecast rise in demand for hydrogen as an energy carrier and as one of the alternatives to fossil-fuel generation.

Among the leading uses for hydrogen is production of electricity in fuel cells, in which there is growing interest.

Cost comparisons with other renewable technologies for hydrogen production show favorable results. The solar hydrogen concept is also designed to be competitive with conventional fuels and will avoid the bottleneck of high investment costs that often occur with new energy technologies.

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