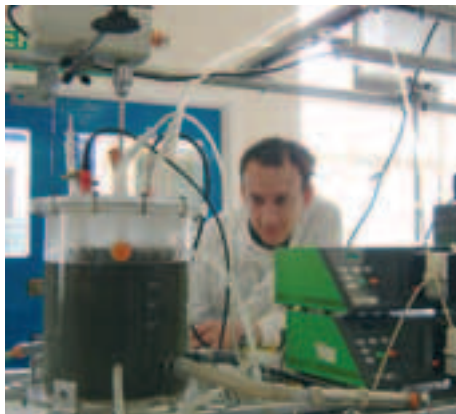




Hydrogen

Hydrogen has the potential to replace fossil fuels and become the versatile fuel of the future. Like electricity, it is generated using external energy sources. At present it is mainly produced from natural gas by steam methane reforming. However, hydrogen produced sustainably can be the basis of a low carbon economy, delivering a secure energy supply to a locality.

Hydrogen can be produced from renewable energy sources by a range of large or small scale processes. Electrolysis of water to hydrogen is a mature technology, which could be coupled to hydrogen storage to help overcome the intermittency of solar, marine and wind power. Hydrogen production from dry biomass by combustion technologies or wet biomass by fermentation is currently at the development stage.



Hydrogen and Wales

The Hydrogen Research Unit team in the University of Glamorgan is investigating the way in which hydrogen can contribute to the country's energy needs. The team is internationally recognised and multi-disciplinary, combining engineering, science, technology and economics.

We have recently completed a 2-year project, part-funded by the EU European Regional Development Fund (Objective 1) examining the social, economic and technical implications of moving to a hydrogen economy in

Wales. This project had backing from the Welsh Assembly Government and we continue with the network of 70 organisations across Wales and UK. The book 'Hydrogen and Wales' outlines the status of hydrogen development around the world and presents a road map for the development of the hydrogen economy in Wales.
www.H2Wales.org.uk



Members of the Hydrogen and Wales network identified as a priority several demonstration projects. Funding is being sought for two renewable hydrogen demonstration projects based in Wales which have industrial partners. In collaboration with the Carmarthenshire Energy Agency and others, a Wales & Ireland rural hydrogen energy project has received EU funding via Interreg III.

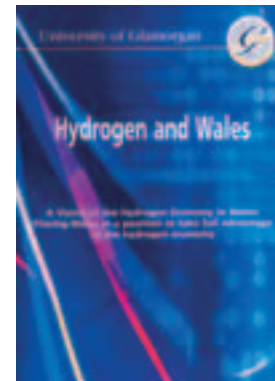
Hydrogen production by fermentation

Food industry co-products and crops rich in carbohydrates can be fermented in the dark to produce hydrogen. There is world-wide interest in this process since it uses well-known reactor technology, but the biological aspects must first be studied. Mixed microbial communities obtained from natural sources convert the range of carbohydrates present in organic materials to hydrogen and fermentation end products. These products are good substrates for anaerobic digestion to methane. Conditions which allow stable operation of the hydrogen reactor and maximise hydrogen yield are only now becoming known.

With the aid of EU Marie Curie Fellowships we are now able to investigate the molecular biological

composition of the bacterial consortia within the biohydrogen reactor, together with state-of-the-art LC MS/MS analysis of the biochemical intermediates. An EU FP6 STREP project, 'REMOVALS' is investigating biohydrogen production from sewage sludge. This builds on current EPSRC funded collaborative work with a major utility company, RWE Thames Water.

With a grant from the Carbon Trust's LCIP programme, pilot scale work is



commencing at a factory site at Barry, South Wales, to investigate the feasibility of sustainable hydrogen production from starch industry co-products. This work is in collaboration

with Rank Hovis and Hydrogen Solar. We are funded by the UK Engineering and Physical Sciences Research Council's SUPERGEN programme to investigate the fermentative production of hydrogen from energy crops such as perennial rye grass, fodder and sugar beets and fodder maize. A pilot plant is being sited at IGER, Aberystwyth, to continue this work. With funding from three UK Research Councils under the TSEC programme we are collaborating in an evaluation of biomass supply chains in the UK for such technology.

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