A High Performance Catalyst for Low Activation Energy Dehydrogenation

Patent Title:	Catalyst for Hydrogen Generation from Small Organic Molecules
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This invention provides a high performance catalyst for dehydrogenation by choosing which low activation energy dehydrogenation can be achieved at near room temperature and atmospheric pressure.

Market Opportunity

Fuel cells can have a very high efficiency in converting chemical energy to electrical energy, especially when they are operated at low power density and use pure hydrogen and oxygen as reactants. A recent study by SBI Energy predicts the fuel cell market could possibly reach over US$1 billion by 2014. This has drawn much interest from renewable energy investors. According to another report provided by Fuel Cell Technologies, the fuel cell was estimated at nearly US$598 million in 2010 and could double to $1.22 billion by 2014. This signifies a Compound Annual Growth Rate (CAGR) of about 20%. [1].

The HKU Invention

This invention was developed under the clean energy research program at The University of Hong Kong (HKU) and provides catalysts with which low activation energy dehydrogenation can be implemented at near ambient temperatures and pressures. For example, the heterogeneous catalyst provided by this invention decomposes formic acid in liquid water at ambient temperature with high rates, yielding exclusively hydrogen and carbon dioxide with a very low activation energy. As shown in figure 1, an example of the catalyst, Pt-Ru-BiOx catalyst, is of high selectivity and high reaction rate at ambient conditions compared with the existing catalysts (e.g. Pt-Bi_2O_3, Ru-Bi_2O_3).

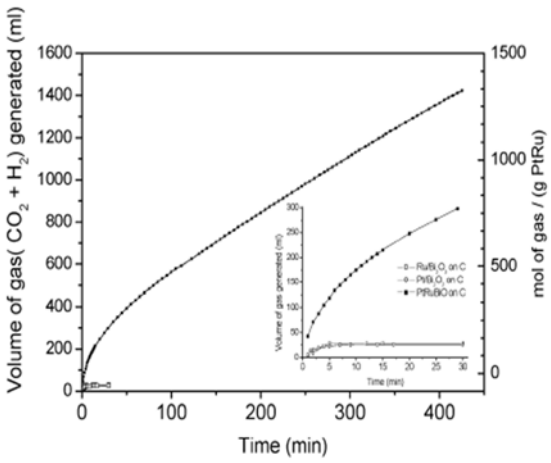

Fig. 1 Decomposition of formic acid on Pt–Ru–BiO_x/C (Pt/Ru/Bi ~ 2:1:4) at 80 °C over 7 h. Inset: activity of initial 30 min for better comparison with Pt–Bi_2O_3 /C and Ru–Bi_2O_3/C.

Using the catalyst provided by the HKU invention will increase the conversion rate of dehydrogenation and save the cost of feeding fuel cells. It shows promise as a convenient hydrogen generation device. Additionally, the success of a low temperature water-gas shift reaction can also help in the generation of hydrogen as a clean fuel and improve carbon capturing [2].

Technology Transfer Office

VERSITECH LTD.

About the Lead Inventor

Kwong-Yu Chan is a Professor in the Department of Chemistry, the University of Hong Kong. He has a B.Sc. from the University of Alberta and an M.S. and a Ph.D. from Cornell University, all in Chemical Engineering. He worked briefly as an assistant lecturer in Hong Kong Polytechnic, as an engineer in Hong Kong Oxygen & Acetylene Company and as a research associate at Case Western Reserve University. At HKU, he has maintained an active research program on molecular simulation and materials for fuel cells and electrochemical applications. He has published over 130 papers on various topics in electrochemistry, physical chemistry, and materials. Currently, he is the Asian editor of Journal of Experimental Nanosciense.

References

[1] http://www.renewablepowernews.com/archives/1783

[2] http://chem.hku.hk/~kyc/hg.html

About Versitech Limited and the University of Hong Kong

Versitech Limited is the technology transfer and commercial arm of the University of Hong Kong (HKU). Being the first and foremost university in Hong Kong, HKU is an institution with a long and distinguished academic heritage, in addition to an international reputation for forward-looking pioneering research. HKU is consistently ranked among the very best in Asia by QS and Times Higher Education.

Contact Us

Address: Room 405A, Cyberport 4, 100 Cyberport Road, Hong Kong

Tel: (852) 2299 0111 Fax: (852) 2299 0122

Email: info@versitech.hku.hk Web: http://versitech.hku.hk