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# ADVANCED MATERIALS & PROCESSING

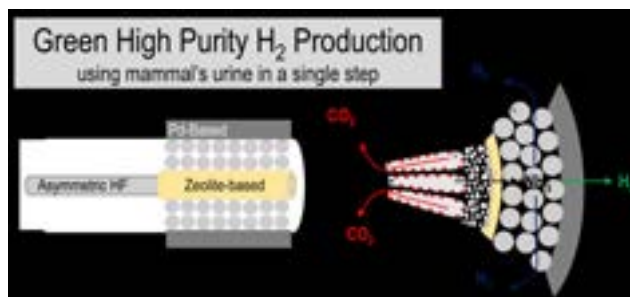
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## Biological cell inspired reactors for an increasing population world

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Dr Francisco R. García-García research seeks sustainable solutions to today's emission control and energy production challenges by mimicking biological cell strategies. Biological cells can be seen as enhanced multifunctional reactors specifically designed to solve fundamental chemical engineering issues such as thermodynamic limitations, catalyst deactivation, and product separation. For example, cells can overcome the thermodynamic limitations because the reaction sites are enclosed within the cell membrane, which is permeable to some of the reaction products. Likewise, cyclic vs linear pathways allow a quick and economic solution to chemical problems. While these approaches are common in cells, they are only sporadically applied technologically in a purposeful manner. The aim of Dr Francisco R. García-García research group is to design, develop and fabricate multifunctional catalytic reactors inspired by how biological cells work, which allows the integration of multi-processes in a single device. The integration of multi-process (reaction, regeneration and separation) in a single reactor enables the intensification of the overall process, making it safer, cleaner, smaller and cheaper. So far the difficulty of combining chemistry, materials science and engineering knowledge in a single unit has prevented the full development of this concept. In this respect, Dr Francisco R. García-García is recognized for his knowledge in the area of gas phase heterogeneous catalysis, new materials development, membrane technology and chemical looping in the interphase between chemistry and chemical engineering. The below biological cell inspired multifunctional reactor enables the production of high purity hydrogen by using mammal's urine as a feedstock. The integration of multi-process (i.e. reaction and separation) in a single unit allows hydrogen production to be done in a single step.



### Biography

Dr Francisco R. García-García is a Lecturer in Chemical Reaction Engineering at the School of Engineering at University of Edinburgh. He holds an MSc in Chemistry by the Autónoma University of Madrid and a PhD in Chemical Engineering by the Institute of Catalysis and Petroleum-chemistry, CSIC. He gained his first post-doctoral experience working at the Department of Chemical Engineering of Imperial College London. In this period, he focused in the design and development of catalytic multifunctional reactors for hydrogen production. Afterwards, he worked as a Senior Scientist at Johnson Matthey in the Emissions Control Department. Despite having a very rewarding experience working in industry, he soon realized that he preferred to be involved in more fundamental science and he moved back to the academia. Hence, he joined the UK Catalysis Hub as a research fellow working at the Chemical Engineering Department at Cambridge University, and at the Chemical Engineering Department at Newcastle University. During this time his research focused in chemical looping reforming for syngas and hydrogen production.

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