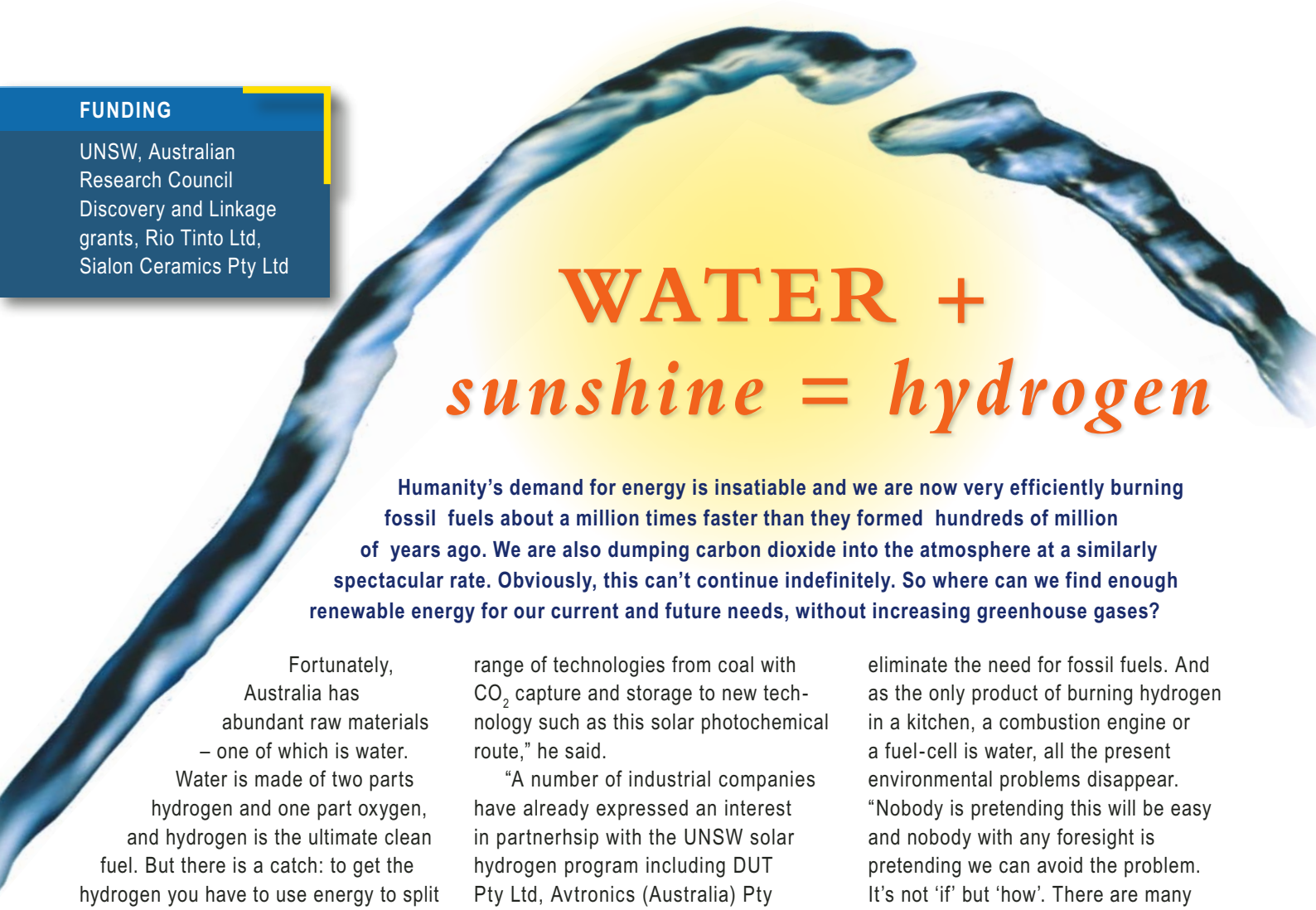
FUNDING

UNSW, Australian Research Council Discovery and Linkage grants, Rio Tinto Ltd, Sialon Ceramics Pty Ltd



WATER + *sunshine = hydrogen*

Humanity's demand for energy is insatiable and we are now very efficiently burning fossil fuels about a million times faster than they formed hundreds of million of years ago. We are also dumping carbon dioxide into the atmosphere at a similarly spectacular rate. Obviously, this can't continue indefinitely. So where can we find enough renewable energy for our current and future needs, without increasing greenhouse gases?

Fortunately, Australia has abundant raw materials – one of which is water. Water is made of two parts hydrogen and one part oxygen, and hydrogen is the ultimate clean fuel. But there is a catch: to get the hydrogen you have to use energy to split the strong chemical bond between the hydrogen and oxygen atoms.

Enter Professors Janusz Nowotny, Director of UNSW's Centre for Materials Research in Energy Conversion, and Charles Sorrell, several post-docs and five PhD students, who are now part of a worldwide network of researchers dedicated to harnessing the sun's energy, of which Australia has more than it can handle, to split water into hydrogen and oxygen. The project is also being partnered by Rio Tinto Ltd and Sialon Ceramics Pty Ltd.

According to Rio Tinto's General Manager – Technology Support Dr Ray Shaw, an early outcome could be a more environmentally friendly, economically attractive local source of fuel for Rio Tinto's Group's remote mining operations. "In the longer term the technology is consistent with Rio Tinto's interest in an eventual move towards a hydrogen economy, which will require a range of technologies from coal with CO_2 capture and storage to new technology such as this solar photochemical route," he said.

"A number of industrial companies have already expressed an interest in partnerhsip with the UNSW solar hydrogen program including DUT Pty Ltd, Avtronics (Australia) Pty Ltd, Stratum Resources, the Austral Brick Company Pty Ltd and Pentax Corporation (Japan)," said Janusz Nowotny.

"If we covered an area of 40 by 40 kilometres square in central Australia with solar-hydrogen cells, we could generate all Australia's energy needs. This area could be achieved if all individual households in Australia are covered with solar hydrogen panels. Any more, and we would have an energy export industry. Any less, and we will ultimately have to compete with all the other energy consumers in an energy-hungry world. Solar hydrogen is expected to form, along with photovoltaic electricity, a global energy system."

According to the US Department of Energy, an efficiency of 10 per cent in converting solar energy into hydrogen energy would result in a commercially viable industry that would eventually eliminate the need for fossil fuels. And as the only product of burning hydrogen in a kitchen, a combustion engine or a fuel-cell is water, all the present environmental problems disappear. "Nobody is pretending this will be easy and nobody with any foresight is pretending we can avoid the problem. It's not 'if' but 'how'. There are many photo-electrochemical materials able to split water into its gases and our network believes titania, titanium dioxide, is the best of them, for a variety of reasons," he said.

"Titania is a very stable mineral, it lasts for billions of years, and Australia has huge reserves, but in its pure form it is very inefficient at using the sun's energy to split water.

"Our research is aimed at finding the least expensive method of making the most efficient electrodes. We are working with partners in Japan, Korea, the US and Europe to speed this research.

"Although the hydrogen economy is about 20 years from dominance, experience with other high technology energy industries shows that this research is already urgent."

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