THE AUSTRALIAN NATIONAL UNIVERSITY

Cleanroom Science on the Road to Cleaner Air

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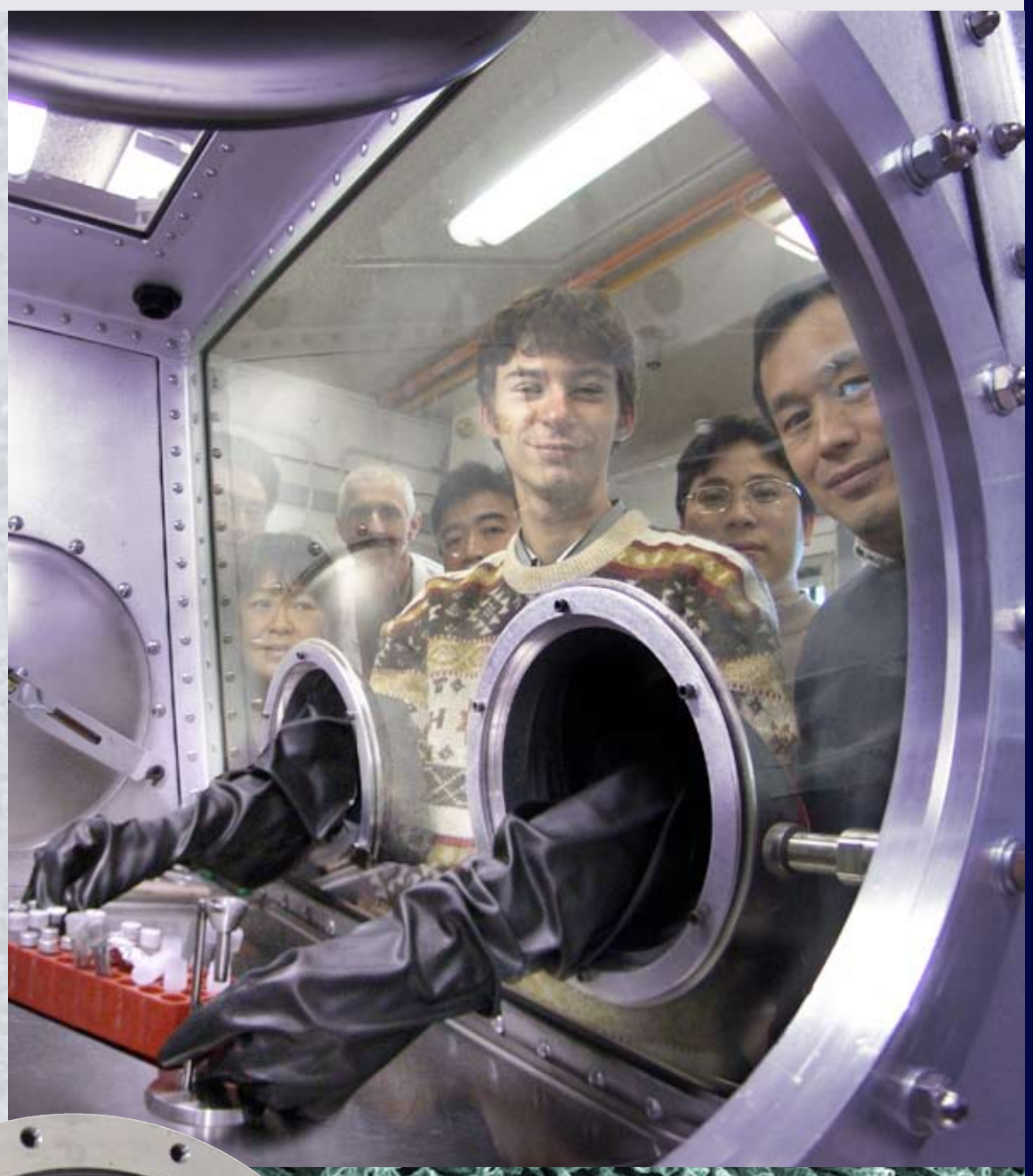
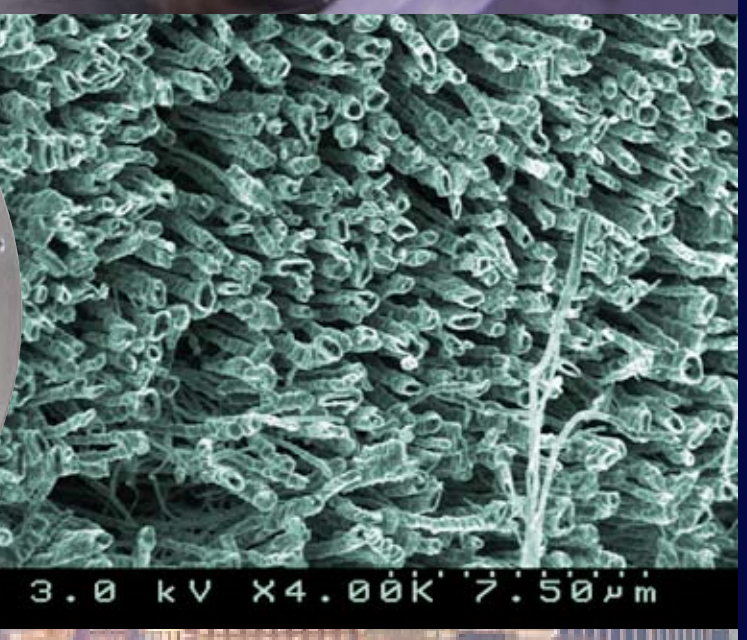
Rising world oil prices and concerns about greenhouse gas emissions are increasing pressure to find a viable alternative to petrol and diesel as transport fuels. One very promising candidate is hydrogen which can be combined with atmospheric oxygen in fuel cells to produce the large quantities of electrical power required to drive a car. Hydrogen is a very attractive transport fuel because it is abundant, renewable and its consumption in fuel cells produces no greenhouse emissions at all.

The difficulty to date has been devising a safe way to store the volatile gas in a motor vehicle. Both gas cylinders and hydrogen liquid in cryogenic containers present an explosion hazard in the event of an accident. One revolutionary option for hydrogen storage is carbon nanotubes - microscopic cage like tubes of carbon atoms. Because of their structure and size the tubes have the ability to adsorb hydrogen gas in large quantities which can be re-released by mild heating. One stumbling block is that to date, manufacture of very large quantities of nanotubes has simply not been an economically viable proposition.

However work by scientists at the ANU may be set to change all this. A novel process involving high-energy ball milling followed by a series of carefully controlled annealing stages has enabled scientists to manufacture large quantities of nanotubes in carbon, boron nitride and other materials cheaply and easily. This ANU process is readily adaptable to manufacture of nanotubes on an industrial scale and has led to the first commercial availability of boron nitride tubes. It is now hoped that the ANU nanotube technology will be a crucial step on the road to hydrogen cars and a safer cleaner environment.



Ball milling of graphite powder may the key to efficient production of carbon nanotubes such as those pictured to the right,.
(A human hair on the same scale would be 100 times thicker than the width of this page



Carbon nanotubes may present the perfect solution to hydrogen storage and pave the way for clean fuel cell cars of the future