UltraBattery Brings Hybrid Vehicles Closer

CSIRO scientists have described their UltraBattery technology as "a leap forward for low emission transport and uptake of HEVs [Hybrid Electric Vehicles]". If it can deliver on its promise, the UltraBattery may also overcome a major obstacle for renewable energy.

"The UltraBattery has a life cycle that is at least four times longer and produces 50% more power than conventional battery systems," says David Lamb, head of low emissions transport research with CSIRO's Transformed Flagship. "It's also about 70% cheaper than the batteries currently used in HEVs."

Car manufacturers currently have a choice of battery technologies, but all have drawbacks. Lead–acid batteries are too heavy and absorb and release energy too slowly to be very useful in hybrid or electric vehicles. Lithium is considered dangerous, and is difficult to scale up from laptops or mobile phones. Nickel–metal hydride (NiMH) batteries currently dominate the hybrid car market but they are expensive, with estimated costs exceeding $2000.

The UltraBattery combines traditional lead–acid batteries with supercapacitors. The capacitors quickly absorb and release energy, giving far better acceleration than a normal lead–acid battery could provide, as well as efficiently capturing energy when the vehicle brakes. The lead–acid batteries do their traditional job of cheap, longer-term storage.

Earlier attempts to combine capacitors and batteries required expensive electronics, but Lamb says the UltraBattery builds the two together. "If you had an electrode where half was lead and half was carbon you'd be at the most primitive stage of our work."

This hybrid electric vehicle is powered by CSIRO's new UltraBattery, dramatically improving its performance.

Photo: Advanced Lead–Acid Battery Consortium

For the last year an HEV has been testing the UltraBattery at the Millbrook Proving Ground in the UK. The battery passed 100,000 miles earlier this year, demonstrating its robustness.

The only drawback is weight, with the Ultrabattery used at Millbrook weighing 17 kg more than the NiMH equivalent, reducing fuel efficiency by 2.8%. This may keep the Ultrabattery out of the high end of the hybrid market, but Lamb anticipates by the end of 2009 it will be in mass production for hybrid models where price is a major factor.

The Ultrabattery has the potential to address part of the storage challenge for intermittent energy production from renewable sources, the major obstacle to greater use of non-polluting energy. It will enable power from wind or solar sources to be stored and retrieved quickly to cope with short-term fluctuations, but further developments are required for longer-term storage, including overnight consumption of solar energy.

Breast Cancers Put to Sleep

Suppression of the *Id1* gene may put some of the most dangerous breast cancers to sleep, enabling the body to eventually swallow them up.

Id1 is associated with the most aggressive forms of breast cancer, which also lack the oestrogen receptors required to make them susceptible to the drug Tamoxifen. Dr Alex Swarbrick of The Garvan Institute, in collaboration with Nobel Prize winner Michael Bishop of the University of California, demonstrated that *Id1* drives the growth of some mouse tumours.

"We also showed that if we genetically switch off the *Id1* gene in an established tumour, those mice live much longer than mice with continual *Id1* expression in their tumour," Swarbrick said. "In fact about 40% of them were cured and the tumours just shrank away."

The tumours were controlled using the relatively poorly understood process of "senescence". Swarbrick says: "One of our most surprising findings was that although the tumours went away, the cells making up the tumour didn't die, as you'd expect". Instead they lost the capacity to divide.

The tumours therefore could not get any bigger, a situation some oncologists refer to as being put to sleep. "You induce a terminal sleep, and then the immune system just gobbles them up," Swarbrick says.

An understanding of senescence could be particularly valuable because, as Swarbrick notes: "Many cancers mutate the genes involved in cell death, so it's hard to kill them".

However, the research is at an early stage, and like research into the *SATB*1 gene (see pp.36-37) is far from reaching clinical applications.