the Prius, Toyota's hybrid electric vehicle (HEV). Currently, the Prius (second generation coupled to a gasoline internal combustion engine) contains a new rectangular battery module (21 kW) coupled to a 33 kW gasoline engine. This delivers 3.4 litres/100 km under the Japanese driving test. When compared to a pure electric vehicle, this HEV has a longer driving range, good fuel economy and good drivability without the need for recharging. The year 2001 Prius meets the Japanese and U.S. SULEV emissions, as well as the Euro 4 regulations. The Prius is the first Toyota vehicle, and perhaps one of the first-ever production vehicles, to use a catalyst support of 900 cells inch^{-2}, wall thickness 0.5 mm, carrying a palladium and rhodium catalyst. The increase in highly active geometric surface area has been optimised together with an ~ 19 per cent lower total catalyst volume than prior systems. It contains a hydrocarbon absorbing component to assist hydrocarbon capture at low temperatures with subsequent oxidation after light-off is complete.

Future Vehicles and Technologies

It is expected that future vehicles will include more models with direct injection (gasoline and CNG) with advanced variable valve timing. Powertrains will be based more on combinations of technologies, such as turbo-charged CNG, CAI with direct injection, and CNG with direct injection. The market will become segmented with some sectors finding unique solutions (HDD vehicles will remain for trucks/transport of goods). In other areas multiple solutions are possible, with fuel cells and hydrogen-based fuels expected to eventually gain a large part of the market share. Hybridisation and hybrid vehicles will begin to play a prominent part in powertrains, with electric/fuel combinations being prominent. Clearly, the variety of powertrain combinations will have an effect on the catalyst systems they use. Future developments will need to take all component into consideration (filters, catalysts, monitors, sensors, fuels, etc.) and to maximise any synergistic effects to achieve the lowest overall emissions, and the lowest possible CO_2 levels for their class. Vehicle designers and component suppliers will probably work together closely to achieve cost-effective solutions. In general, consumers will increasingly demand comfort, safety, cost reductions, good driving performance, enhanced durability, reliability and low emissions. However, the catalytic converter will clearly remain the main pollution-control device for the next generation of vehicles, although, 15 years from now, it may not be recognisable in its present form.

The papers presented at this conference will be published in Spring 2001 in the IMechE Seminar publication series. Information can be found at: http://www.imeche.org.uk. J. P. WARREN

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Palladium Cross-Coupling Reaction for Brain Tracers

Brain imaging via positron emission tomography (PET) using the short-lived ^{11}C positron emitter (half-life ~ 20 minutes) requires a fast chemical reaction to incorporate the small amounts of ^{11}C into a carrier (tracer) which delivers it to the tissue under examination.

Researchers in Japan and Sweden have now developed a new rapid, efficient Stille methylation of arylstannanes which produces a structure system that can deliver sufficient quantities of ^{11}C to prostaglandin receptors (IP_2) in the brain (M. Suzuki, H. Doi, K. Kato, M. Björkman, B. Långström, Y. Watanabe and R. Noyori, *Tetrahedron*, 2000, **56**, (42), 8263–8273). The Stille methylation involves a palladium-promoted cross-coupling reaction of methyl iodide and tributyltin derivatives of tolylisocarbacyclins (TICs); the TIC binds to the IP_2 receptors. In one methylation, which is a novel stepwise operation, an initial methylpalladium complex is produced and is then mixed with other materials for the cross-coupling. The Pd promoter is a Pd(0) complex generated from $Pd_2(dba)_3$ and $P(o\text{-}CH_3C_6H_4)_3$ in the presence of CuCl and K_2CO_3. The synthesis is highly reproducible, and with ^{11}C incorporated, results in a [^{11}C]-labelled PET tracer with radioactivity of several GBq, which can be injected intravenously.