poisoning of the sintered catalyst. The poisoning process is also accelerated by the presence of halide scavenger, as shown in Figure 5. The greater toxicity in the presence of scavenger is reflected by the lower performance, even though the amount of lead deposited on the catalyst is reduced by the scavenging action.

Comparison of the performance of the engine aged catalyst and the simulator results shows good agreement for the samples run at similar operating temperature (~600°C) (Fig. 6). Further, the simulator has enabled us to deduce that the superior performance of the catalysts run in position 2 close to the manifold is due to the deposition of the less toxic lead oxide in this position, whereas in the remote position the more toxic lead halides and lead oxyhalides are deposited leading to greater catalyst degradation.

The good performance in position 2 was achieved even though the amount of lead deposited was the highest observed and approached nearly half the ingoing lead to the engine. Thus by judicious selection of the catalyst position and operating temperature catalyst deterioration can be minimised, the catalyst is highly lead poison resistant, and can also act as an effective lead filter.

Design studies such as these have enabled Johnson Matthey to achieve emission levels below the United States Statutory Standards recommended for 1982 for over 50,000 miles vehicle operation.

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Palladium Flakes for Hydrogen Solid Storage Applications

Hydrogen appears capable of playing an important role in the provision of energy for the future. Whether it will provide all the answers to the world's fuel problems, as some believe, is open to discussion but it is certainly unlikely that it will quickly realise its full potential unless the problems which its exploitation will produce are anticipated and solutions to these problems found. Forward looking organisations throughout the world are now investigating many different aspects of hydrogen energy. A recent article by R. M. German and V. Ham, of the Sandia Laboratories, Livermore, California (*Internat. J. Powder Metall. Powder Technol.*, 1975, **11**, (2), 97–100) outlines and discusses a technique for the production of submicron thick metal flakes which appear potentially attractive for hydrogen solid storage applications.

On account of their hydride properties palladium and erbium were selected for investigation. In the case of the palladium, where pure sponge was the starting material, the process was carried out in ethyl alcohol using argon as a cover gas in an attrition mill containing 0.6 cm diameter hardened steel balls and running at a reduced speed of 60 r.p.m., which was found to minimise the disintegration of the flakes. Palladium has the advantage of flaking more readily than erbium and giving a considerably higher aspect ratio. Flakes having short diffusion paths, but without the handling properties generally associated with ultrafine powders, produced by this process have now been provided for hydrogen solid storage studies.