

Advanced ceramic supports for a new catalytic converter design.

**Imperial College
London**


Aston University
Birmingham

LIQTECH

PILOT LINE CO-OWNER

Along with Aston, they produce the substrate which they give to Liqtech

Imperial carries out the performance testing of the impregnated membranes

Owns two of the existing patents (which will

PILOT LINE CO-OWNER

Along with Imperial, they produce the substrate which they give to Liqtech

Astons pilot line process and the binding process will be patented

IP Owner of the catalyst and of the process of impregnating the catalyst

Liqtech has patented the catalyst use but not the impregnation process

THE CONTEXT

Cordierite monoliths have been the cornerstone of emission control systems in automotive applications for over 40 years. To eliminate toxic components from emissions, platinum group metal (PGM) catalysts are typically combined with other inorganic compounds in the form of a washcoat, which is coated onto the surface of the channels within a monolith. In order to achieve the optimum performance of the catalyst, high geometric surface areas (GSA) are required. This has been achieved by reducing the channel diameters/wall thickness. However, this leads to a raise in pressure drop when exhaust passes through the channels, reducing the engine performance. The PGM catalysts account for the largest proportion of the cost in an emission control system (15B\$/year spent for automotive applications). To put this in perspective, the emission control system for a large vehicle is now the most expensive component close to that of the engine. Moreover, use PGM is set to increase to meet more stringent regulations. Thus, it is crucial to minimize the quantity of the PGM usage, but still comply with emission regulations.

THE CHALLENGE

This showcase will design, develop and validate a new catalytic converter design that complies with the latest regulations, and more importantly significantly reduces the amount and costs of PGM catalyst. Distinguished from conventional cordierite monoliths, micro-monoliths in this showcase have a plurality of micro-voids or micro-channels inside channel walls. This enables 7 to 8-fold increase in GSA, together with high open front area (OFA). Moreover, such a membrane micro-structure boosts interaction between emission gases and catalyst leading to full conversion of toxic components by using a much less amount of PGM catalysts. Meanwhile, the micro-monolith substrate has no performance-structure limitations as conventional cordierite counterparts, leading to a step change in ceramic substrate technology

KEY DRIVERS OF THE SERVICE: THE VALUE PROPOSITION

Manufacturers in the automobile industry are required to utilize low-pollution technology and comply with government-mandated emission standards. Various strategic partnerships between vehicle manufacturers and component manufacturers across the globe are anticipated to boost the automotive catalytic converter market. Manufacturers are using durable and high-quality materials for automobile components in order to make vehicles more fuel-efficient. This is projected to boost the automotive catalytic converter market. Distinguished from conventional cordierite monoliths, micro-monoliths in this showcase have a plurality of micro-voids or micro-channels inside channel walls. These substrates have no performance-structure limitations as conventional cordierite counterparts, leading to a step change in ceramic substrate technology.

Efficiency

- smaller volume than commercially available = more space for engine bay = increased engine efficiency
- using less catalyst so the profit will come from this saving despite the ceramic filter being more expensive
- Identified the most potential catalyst with lowest light-off temperature.

Performance

- more durable during aging test
- performs better at high space velocity
- enables 7 to 8-fold increase in GSA, together with high open front area (OFA)

Impact

- less CO₂ released (less combustion)
- use less precious metals to achieve the same efficiencies
- reduces the amount and costs of PGM catalyst
- boosts interaction between emission gases and catalyst leading to full conversion of toxic components by using a much less amount of PGM catalysts