Scientists' gold discovery sheds light on catalysis

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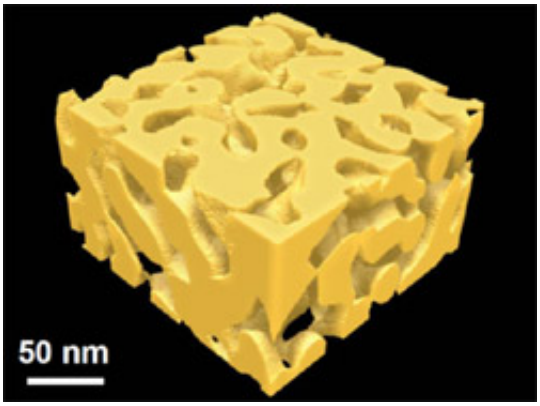

(Phys.org) -- A physicist at the University of York has played a key role in international research which has made an important advance in establishing the catalytic properties of gold at a nano level.

Dr Keith McKenna was part of a research team which discovered that the catalytic activity of nanoporous gold (NPG) originates from high concentrations of surface defects present within its complex three-dimensional structure.

The research, which is published online in Nature Materials, has the potential to assist in the development of more efficient and durable catalytic converters and fuel cells because nanoporous gold is a catalytic

agent for oxidising carbon monoxide.

Bulk gold – the sort used in watches and jewellery – is inert but nanoporous gold possesses high catalytic activity towards oxidation reactions. The research team, which also included scientists from Japan, China and the USA, discovered, that this activity can be identified with surface defects found within its complex nanoporous structure. While nanoporous gold exhibits comparable activity to nanoparticulate gold, it is considerably more stable making it attractive for the development of catalysts with high performance and long lifetimes.

They created NPG by immersing an alloy of gold and silver in a chemical solution which removed the latter metal to create a porous atomic structure. Then, using transmission electron microscopy, they were able to detect evidence that the surface defects on the NPG were active sites for catalysis and the residual silver made them substantially more stable.

Dr McKenna, of the Department of Physics at the University of York, said: “Unlike gold nanoparticles, dealloyed NPG is unsupported so we are able to monitor its catalytic activity more accurately. We found that there are many surface defects present within the complex structure of NPG which are responsible for the high catalytic activity.

“This work has given us a greater understanding of the catalytic mechanisms of NPG which will, in turn, shed light on the mechanisms of gold catalysis more broadly.”

More information: The paper ‘Atomic origins of the high catalytic activity of nanoporous gold’ is published online in *Nature Materials*.

Provided by University of York