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The magnetic tape in cassettes is coated with cobalt and iron oxide particles

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Cassettes inspire Fischer-Tropsch catalyst

Oil company Total patents process

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CHEMISTS at the University of Amsterdam, the Netherlands, have developed a new cobalt-based catalyst for the Fischer-Tropsch process inspired by 1960s techniques to produce audio cassette tapes.

Cobalt is a highly effective catalyst for the Fischer-Tropsch process, which produces liquid hydrocarbons from syngas, a mixture of carbon monoxide and hydrogen. It is becoming increasingly important as a way to produce cleaner-burning synthetic fuels from coal, as well as producing synthetic diesel from the abundant supplies of natural gas from shale, and from biomass. Typical Fischer-Tropsch reactors use hundreds of tons of catalyst, and cobalt is expensive. Oil company Total contacted the Amsterdam Heterogeneous Catalysis and Sustainable Chemistry group to find a way to make a cheaper cobalt catalyst.

The catalyst developed by the group, led by chemistry professor Gadi Rothenberg, consists of a nanometer-thin cobalt coating on iron oxide particles. The process to make them needed to be simple and reliable, without using expensive chemicals. The researchers turned to a process used in the 1960s to produce magnetic tape for audio cassettes, which were made from thin polymer coated with cigar-shaped cobalt-doped iron oxide particles.

To make the catalyst particles, the team first prepare iron oxide nanoparticles with an 8 nm diameter. They then mix a suspension of the particles with a cobalt salt solution and add a reducing/precipitating agent, which causes the cobalt ions to coat the iron oxide nanoparticles. The reaction takes place at room temperature.

“Although the optimisation of the process took a long time, the result is a simple and straightforward recipe, which is what industry (and engineers) like,” Rothenberg tells ***tce***.

Total has patented both the catalyst and the preparation method.

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