

Recent Developments in the Practical Uses of Gold Nanotechnology (May 2007)

Could gold be used in improving current technology designed for controlling automotive pollution? Five years ago World Gold Council, presented a paper at the leading [car technology forum](#) highlighting the potential benefits and technical barriers to using gold in automotive pollution control. The main benefit described in this paper is the potential to increase the cost efficiency of the catalytic convertor by including gold alongside the platinum metals. The main technical barrier to gold's entry into this market concerns durability. In other words, the high temperatures experienced by car catalysts can cause the effectiveness of the gold to decrease over time. Now, US company [Nanostellar](#) has announced that it has overcome this durability issue and has developed a catalyst for diesel engines that contains gold, in combination with the platinum and palladium ingredients. The cost of these catalyst systems is a major issue for car manufacturers and the reduction in the amount of precious metal used is an on-going target for them. To reduce the amount of platinum needed and the overall cost of the catalysts, Nanostellar have pioneered the inclusion of gold. They claim that when compared to next-generation platinum-palladium catalysts, the gold-containing catalyst can increase hydrocarbon oxidation activity (i.e. breakdown of one of exhaust gas pollutants) by 15-20 percent for the same precious-metal cost.

It will be interesting to see how widely this new type of catalyst is adopted by the automotive manufacturers. It is early days, but with the diesel engine market predicted to expand substantially in the coming years, its one of the most exciting and environmentally positive applications for gold to begin to be used in

There are other industrial trials that are currently underway using gold catalysts, including the control of mercury emissions from coal-fired power stations, applications in 'green' chemical production and in the clean-up of polluted water, to name just a few. If you are working in the world of chemistry this really is a hot topic at the moment, and with such a 'groundswell' of activity it bodes well both for creating new applications that will demonstrate the importance of gold to everyday life.

A functional benefit from using gold can also be demonstrated in the liquid crystal display market. This market has grown rapidly in the last 10 years including displays for televisions, mobile phones, cameras, and medical equipment. Some performance limitations remain in LC technology though, and to address these limitations U.S based company, [Solaris Nanosciences](#), is pursuing the development and eventual large-scale manufacturing of gold nanostructures specifically engineered for liquid crystal display applications. These rod structures, or nanorods, can be added into liquid crystals to significantly improve display performance in terms of viewing angle, brightness and power consumption.

Another interesting area is medicine and in particular, treatments for cancer. Many people are aware of the use platinum as an anticancer treatment, in the form of the chemotherapy drugs 'cisplatin' and 'carboplatin'. Those of us with a gold interest are excited that the first clinical trials of a gold nanotechnology-based anticancer drug began last year. The trial by the company [CytImmune Sciences](#) is currently evaluating the safety of the drug and its tumour shrinking response.

With a similar objective in mind, [Nanospectra](#), is focused on the development of gold nanoshells to selectively destroy solid tumours. These nanoshells, are injected into the body and they accumulate within a tumour. Then, rather like a piece of metal heats up in direct sunlight, the nanoshells are heated by shining a near-infrared laser through the skin. This temperature rise causes the tumour to be destroyed. Initial studies in mice have shown that the therapy is 90% effective in treating the cancerous tumours and preventing any re-growth, and the company is currently intending to seek approval to commence a human trial for the treatment of head and neck cancers.

What's exciting is that gold is an absolutely critical component of both of these treatments and they demonstrate, perhaps more eloquently than any other application, what an important and unique metal gold really is.....