



simplification.

Discera micro communication

SEARCH

News

Magazine

Events

Classifieds

Inside Small Tech

- Home
- Fabrication
- Money
- R&D
- Opinion
- Patents
- Profiles

Applications

- Biotech
- Consumer Goods
- Defense
- Energy
- Environment
- IT & Telecom
- Transportation

Reader Services

- Free Subscription
- E-mail Newsletter
- Message Boards
- Career Center
- Reprints
- Glossary
- Small Tech Census
- Advertiser Index

Small Times Media

- About Us
- Contact Us
- Advertising

NEW NANOTECHNOLOGY APPLICATIONS WILL HELP SNUFF OUT SMOG BY CLEANING DIRTY DIESEL

Jul 12, 2001 -

By Rosemary Clandos
Small Times Media West Coast Correspondent

LOS ANGELES, July 12, 2001 - Every year, diesel engines spew 28,000 tons of soot into California's air, making it the dirtiest in the nation. Two nanotechnology applications soon to reach the market will help ease the pollution by providing cleaner-burning fuel and scrubbing engine emissions before they leave the exhaust pipe.

Particulate matter, as it is labeled by environmental officials, is just one of 40 pollutants that makes the air stink and lungs wheeze. But soot is responsible for the majority of the potential airborne cancer risks in California. And it's the stuff most often seen coming out of trucks and school buses.

Diesel particulates will cause 125,000 cancer cases in the United States during a 70-year period, according to a study titled "Cancer Risk from Diesel Particulate: National and Metropolitan Area Estimates for the U.S.," which was prepared by state and territorial air pollution program administrators and an association of local air pollution control officials. The pollutant also exacerbates heart disease, asthma and other lung conditions.

"We're focusing heavily on diesel (emissions) since we put it on our toxic list in 1998," said Gennet Osborn, spokeswoman for the California Air Resources Board.

Cities with the heaviest concentration of diesel soot are Los Angeles, New York, Chicago, the Washington, D.C./ Baltimore area, and San Francisco.

To solve some of the problem, Engelhard Corp. is developing a diesel oxidation catalyst that uses nanoscale layers of precious metals to get rid of particulate matter and other pollutants from diesel engines. And they are working on technology that can refine contaminated natural gas wells, making clean-burning natural gas more available as a replacement for diesel fuel.

Engelhard's diesel oxidation catalysts will use the same nanotechnology used in their automotive catalytic converters for about 30 years. Having invented the catalytic converter, Engelhard was one of the first companies to use nanotechnology for commercial applications.

From the technology viewpoint, it's the extremely small size - one to 10 nanometers - of the precious metals in the catalytic converter that oxidizes hydrocarbons, carbon monoxide and reduces nitrogen-containing oxides, said Robert Ianniello, Engelhard's director of science services.

Palladium, rhodium and platinum are treated with chemicals and heated so that the precious metals are reduced from salt form to the nanoscale. A ceramic substrate is coated with the precious metals and the substrate becomes the catalyst in the converter. The pollutants in the vehicle's exhaust stream pass through the catalytic converter and are oxidized on the surface of the substrate.

In the oxidation process, they are converted into a nontoxic mixture of carbon dioxide and water before rolling out the tailpipe.

- PRINT ARTICLE
- E-MAIL ARTICLE
- ORDER REPRINTS

- Stock
- Small

DOW
9294.4NASDAQ
1447.8S&P
992.99small
times

ME

Unit
found
tha
tu
ME
in

www.m

Hi

COM

Comm

of

Nar

Co

Company officials estimate their products have removed more than 635 million tons of automotive pollutants from the world's air in the last 25 years.

"The regulatory atmosphere forces us to come up with better technology," Ianniello said. "End customers rely on us to meet the requirements."

The California Air Resources Board has targeted 2010 for a 75 percent decrease in particulate matter emissions, and an 85 percent or more decrease is slated for 2020. Regulations such as these have already cleaned the air considerably. In the 1970s, it was common to have 130 smog alerts in the state each year. Now, California residents see one or two per year, Osborn said.

Engelhard's diesel oxidation catalyst is expected to be available for original equipment manufacturers (OEMs) in about three years. The catalyst is undergoing preliminary tests and should be ready in time for 2007 model vehicles, company officials said.

Engelhard has design-level, working partner relationships with the Ford Motor Company, General Motors Corp. and all the other major OEMs as well as diesel engine manufacturers. They also work with companies in the retrofit market, which includes transit systems in cities.

Engelhard will supply the product, engineering and technical support to make sure the converters work on vehicles.

It's a "very lucrative" market, Ianniello said. "We would expect the same kind of percentage that we hold in the automobile catalyst market, which is about 34 percent of the market share."

In addition to about 1.2 million vehicles that generate diesel emissions in California, there are about 15,000 stationary engines, such as those used for power and electricity generation, and about 50,000 portable engines, which include large compressors and heavy equipment, that can benefit from Engelhard's diesel oxidation catalyst.

Japanese automotive companies are leading the effort to produce a competing technology to clean diesel emissions. Diesel particulate traps can snag soot that is about one micrometer or less, holding particles in a filter rather than allowing them into the air.

The filters clog over time and need to be cleaned or replaced. Diesel particulate matter traps have been used in Europe but none have been certified for use in the United States.

"There's still a question about which engines (soot traps) will work on," said Julie Masters, staff attorney at the Natural Resources Defense Council (NRDC). "Engines built before 1991 may not get hot enough."

In the meantime, the NRDC is heavily pushing the use of natural gas to clean the nation's dirty air.

"It is inherently cleaner burning than diesel and lower in toxic emissions," Masters said. "We think that one of the major solutions is to convert fleets to use natural gas. The best conversion fleets would be those that travel regular distances each day, such as transit buses in Los Angeles and other cities."

In one of their most recent projects, Engelhard has developed molecular gate technology that is being used in pilot programs to make nitrogen-contaminated natural gas fields productive.

About 15 percent of the nation's gas reserves are contaminated by nitrogen that reduces the fuel's heating value. If the amount of gas coming out of the well doesn't have a minimum heating capacity, it's not economical to open the well. Current technology to clean the gas is very expensive, Ianniello said.

Using an organic crystalline material known as zeolites, Engelhard's scientists can tailor the zeolites' tiny pores to within one-tenth of an angstrom - that's one-hundredth of a nanometer.

The
Nano
Repub
Confer

July 1
@ UC

A nitrogen molecule is 3.6 angstroms, methane is 3.8 angstroms. Engelhard's researchers alter the pore size of zeolites to 3.7 angstroms so nitrogen can enter the pore and become trapped and the methane could pass through the bed of zeolites.

"A gas well that's 20 percent nitrogen could be brought down to less than 5 percent," Ianniello said. "Gas wells that are viewed as nonprofitable can be opened and profitable, because you have a way to increase the methane content. The capital costs could be on the order of a few million dollars, but there are no consumable costs as there are with the current methodology."

Up to this point, cryogenic systems have been used but they are expensive and require a large output of gas to make them economical.

Gil Yang vice president of Salomon Smith Barney in New York said, "They are the first in applying this kind of technology and it will be more cost effective than what been used in the past."

