

Italians discover a smog-eating cement

By Elisabetta Povoledo

VENICE: When the American architect Richard Meier was asked to create a church in Rome to commemorate the 2,000th anniversary of Christianity, he designed an imposing white concrete structure dominated by three soaring "sails."

The project's main technical sponsor got to work on a cement that would

enhance Meier's trademark white sculptural forms. It came up with a material that essentially cleans itself, minimizing the need for maintenance.

What the sponsor, Italcementi Group, did not know at the time was that the new material — which contained titanium dioxide, a compound used as a white pigment — had another peculiarity. It "eats" surrounding smog.

Extensive testing, sponsored in part

by a European Union research project into "smart" antipollution materials, has since determined that construction products containing titanium dioxide help to destroy air pollutants found in car exhaust and heating emissions, scientists say.

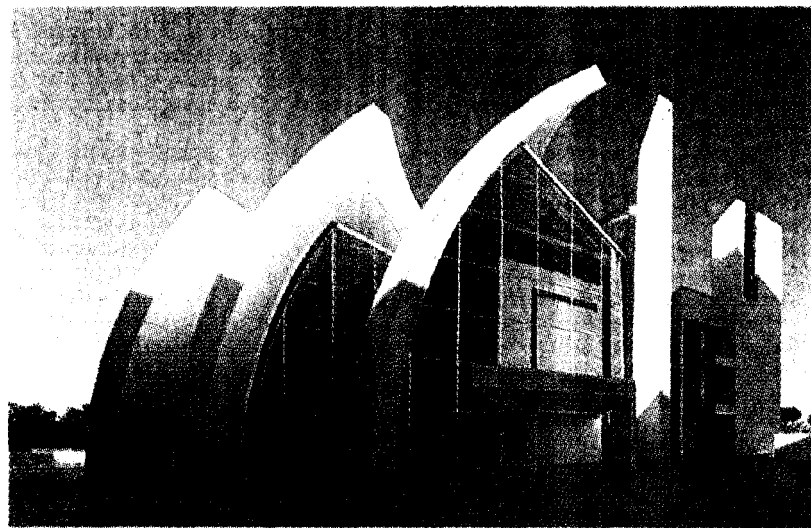
Several companies are now developing "smog-eating" products that can be used not just for the facades of buildings, but also in paint, plaster, and paving materials for roads. The new environment-friendly substances are quietly being tried out in buildings, squares and highways in Europe as well as Japan.

Hailed by some scientists as a breakthrough, the process is still being evaluated by others. The question, said Melanie Sattler, professor of civil and environmental engineering at the University of Texas in Arlington, is "whether coatings on buildings would be able to treat enough of the atmospheric air to make a difference."

Italcementi began developing its product after Meier got his assignment to build the Dives in Misericordia church in 1996 and asked for help.

Titanium dioxide had been used in self-cleaning coatings before because of its photocatalytic properties: sunlight touching the compound triggers a chemical reaction that accelerates natural oxidation.

Upon testing its new cement,



Taipei Liao

A new material used in the Dives in Misericordia church in Rome, designed by the U.S. architect Richard Meier, contains a compound that "eats" surrounding smog.

SMOG, Continued on Page 4

Italians discover a smog-eating cement

SMOG, From Page 1

however, Italcementi realized that the material also had the ability to break down nitrogen oxides emitted in the burning of fossil fuels.

"That means there will be a reduction of pollutants in the atmosphere," said Dimitrios Kotzias, who carried out tests on titanium dioxide construction materials at a center in Ispra, Italy, one of seven institutes that together make up the European Commission's Joint Research Center.

As part of the EU study — known as Picada, for Photocatalytic Innovative Coverings Applications for Depollution Assessment — Italcementi applied the technology to various construction materials, and later patented them. Picada also tested materials developed by other companies, including a paint made by Millennium Chemicals of Britain.

The Picada tests were the first to examine how titanium dioxide would react in common building materials, said Kotzias, who heads the physical and

chemical exposure unit at the Institute for Health and Consumer Protection in Ispra.

"Theoretical work in photocatalysis has been going on since the 1980s," said Enrico Borgarello, Italcementi's head of research and development. "The problem is that no one had developed any practical applications."

In this context, Kotzias said, "Picada was a breakthrough because it showed in large-scale experiments that materials exist that can be efficient in destroying atmospheric pollutants."

According to Italcementi, tests in urban settings determined that some pollutants could be reduced by 20 to 70 percent, depending on atmospheric and light conditions as well as the size of the area treated with the cement.

The reduction of pollutants is greatest within 2.5 meters, or 8.2 feet, of a surface that has been treated, the company said. This means that a pedestrian walking down a street with traffic would inhale fewer pollutants while walking past buildings treated with the substance.

In one test, paving material using photocatalytic cement was used to cover the asphalt surface of a 230-meter-long stretch of road outside Milan with an average traffic flow of 1,000 vehicles per hour. Tests showed a reduction in nitrogen oxides at street level of about 60 percent, according to Italcementi.

The Italcementi product, known as TX Active, has been used at the new Air France headquarters at the Charles de Gaulle airport outside Paris; the police headquarters in Bordeaux; and a multistory apartment building in Ostend, Belgium.

Road surfaces have been paved with the product in Italy — it was notably tried on a square in Florence, Piazza Tanucci — while median barriers have been treated along some divided highways in France.

Elsewhere, in a three-year European research project known as Nanocrete, Swedish and Finnish companies are developing concrete with photocatalytic properties for roads and tunnel walls that break down car exhaust fumes.

Among the partners are research institutes and companies, including Swedish construction group Skanska and the Finnish chemical group Kemira.

Environmental scientists and engineers are following the development of such materials with keen interest.

'Philosophically, it is better never to form pollutants than to find ways to destroy pollutants, but this is a useful technique for air pollutants that humans already make,' said Howard Liljestrand, an expert in environmental chemistry at the University of Texas in Austin.

He cautioned, however, that the cost-

efficiency of such products would depend on long-term performance, adding, 'Catalysts tend to lose their effectiveness over time.'

TX Active costs about 10 times as much as normal cement, or about €1, or \$1.30, per kilogram. But since the photocatalytic concrete is applied very thinly and only to areas that are exposed to the atmosphere, officials at Italcementi say, the cost of treating the facade of a five-story building with the product would be just €100 higher than with traditional paint or plaster. Paving with photocatalytic blocks would raise

the price by 10 to 20 percent.

Now that TX Active has gone beyond the testing phase, does it work? Three years after Meier's church opened in the eastern Rome neighborhood of Tor Tre Teste, the bulk of the majestic structure remains remarkably bright, in contrast to the grimy gray joints not treated with the product. Since building Dives in Misericordia, Meier has used the same material in a Rome museum, Ara Pacis, that was inaugurated this year.

'It's hard to say if it's revolutionary, but we're happy with the results,' Meier said, adding that most architects tried to use environment-friendly materials.

The process is still being evaluated.

Thumbnail image of a newspaper page with headlines: 'U.S. plans full-court press on Chinese', 'Rhosiane vow to ban EU animal products', 'Civilian deaths in Iraq hit a record', 'Italians discover a time-traveler's tomb'.

Thumbnail image of a newspaper page with headlines: 'Iraq civilian deaths at record level', '1 of 7 hostages taken in Nigeria killed in rescue attempt', 'Citing hygiene, Russians vow to ban all EU animal products', 'Italians discover a time-traveler's tomb'.