

Clean air: New paints break down nitrogen oxides

The Seventies: Smog alert in the Ruhr area, acid rain, dying spruce trees in the Bavarian Forest. In those days, the solution was filter systems for the smokestacks in the Ruhr area. Today, people in the urban areas are suffering from high levels of pollution that is being caused by, among other things, automotive traffic. Particularly undesired: the nitrogen oxides (NOX). In the meantime, the European Union tightened the limit values even further; in many communities they are being exceeded. Michael Hüben of the Fraunhofer Institute for Molecular Biology and Applied Ecology IME in Schmallenberg, Germany, knows that "on stretches with heavy traffic there is a particular need for action." During the next two years, the Fraunhofer researchers want to examine in the project "Effectiveness of photo-catalytic removal of nitrogen oxide on coated building test panels" how photo-catalytic surfaces contribute to the removal of NOx and how the coatings prove themselves during long-term operation. On behalf of the German Federal Ministry of Transport, the German Federal Highway Research Institute is sponsoring and supporting the project. The process will be introduced at the 2013 BAU trade fair at the joint booth of the Fraunhofer Building Innovation Alliance.

"Coatings that are photo-catalytically active can help to reduce nitrogen oxides," explains Dr. Michael Hüben, "There are already a number of products available for the photo-catalytic coating of surfaces, but the measurement method standardized according to ISO 22197-1 cannot be applied to all problems. At the IME, we have now developed a special measurement cell which we are using in our project." At the A 4 interstate at Bergisch Gladbach, we will shortly be setting out weathering noise barrier samples that were coated with reactive material. Prepared test samples will be measured at predetermined intervals in the measuring cell. Hüben explains the set-up of the test: "The surface of the test sample must be photo-catalytically active, meaning it removes NOx when exposed to light." The surfaces contain titanium dioxide catalysts, a material that is affordable and available in large quantities. Then, exposed to daylight, titanium dioxide catalyzes the nitrogen oxide into nitrate. "The photo-catalytic activities of the samples are determined using a flow-through process," says the scientist. During the next two years, the experts will determine regularly how much nitrous oxide is being removed. In this manner, they will obtain a solid basis for the long term effects of the coatings. Only then will we be sure that the coatings really do help and that larger surfaces, such as entire housing tracts, can be economically furnished with coats that are photo-catalytically effective. This would make it possible to reduce the particle pollution in urban areas.

"Another area of application for the measurement process are interior rooms. Here, too, there are products commercially available that promise to improve air quality in interior rooms," explains Mr. Hüben's colleague, Frank Neumann from the Fraunhofer Institute for Surface Engineering and Thin Films IST. "Here, too, experimental measurements help us to work up standards and certifications and standardize existing test processes." At the Trade Fair BAU 2013, the researchers

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will present these and more photo-catalytic applications for the interior and exterior, using a stylized house in the booth of the Fraunhofer Building Innovation Alliance. The motto is: CITY OF TOMORROW - Intelligent Building for the City of the Future.

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