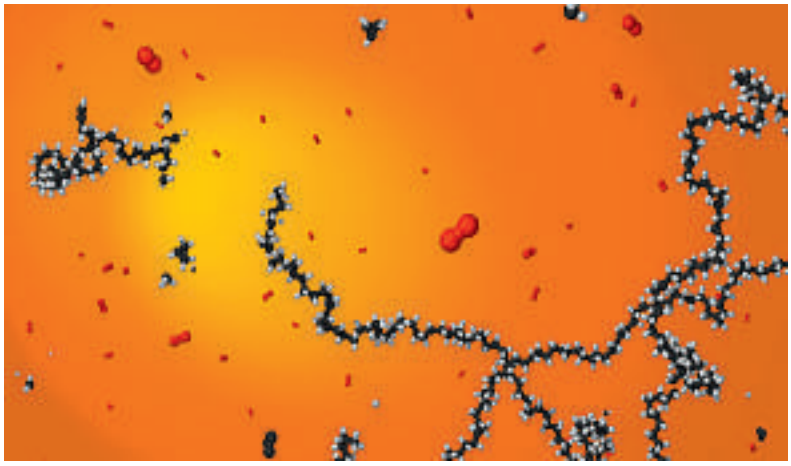
Fine Nose for Gases

Still, the nightmare of any car driver is a fire in a tunnel. Because: When a fire is recognized, it is mostly too late for a rescue. A chemical reaction dynamics simulation of the young company Xirrus from Zurich provides exploration how fires may be detected earlier. The idea of the gas sensor will be further evaluated.



Polyethylene during a chemical simulated combustion: The polymer chain breaks and decomposes into fragments, that are detected as fire gas.

(bf) Current warning systems for fires in road tunnels mostly rely on the detection of smoke or increased temperature. They only react on a really developed fire – however relatively late.

Goal of a project under the contract of the Federal Roads Office (FEDRO) is to find a sensor, which like a dog's nose reacts on the fire products of developing fires and identifies fires significantly earlier. In this way, the safety in road tunnels shall be increased.

Here comes the young Swiss company Xirrus from Zurich into play. The company offers computer simulations of complex processes and systems as a service provider. Whatever, if it is the optimization of a glider flight collision avoidance warning system or the simulation of the elasticity of nano particles: the experts of Xirrus have achieved valuable help with their computer analysis. In the present case, for the Xirrus co-owner Christian Berweger the leading question was: On which fire product shall the sensor react? "The goal is more complex, since the tunnel's air contains all the exhaust of combustion engines in concentrated form. Typical fire gases such as carbon dioxide, carbon monoxide or methane are not to come into consideration", so Christian Berweger. His conclusion: The specialist's literature has turned out to be incomplete.

The chemically reactive simulation of smouldering and combustion of a multitude of artifial and natural compounds under different conditions has been closing this gap. Extensive catalogues of fire intermediate products and components of incomplete combustion have been precisely identified and processed in the digital lab. In the long lists substances have been identified, that do exist in all fires under all circumstances, but are not found in normal tunnel's air. Berweger complements: "Xirrus is the first service provider for this type of chemical reaction dynamics simulations worldwide. The largely automated processes in the digital lab have proven to be quicker, more efficient and less expensive than intensive literature research and experimental measurements".

The idea of a gas sensor is further evaluated at the present. The availability of fitting sensors will be verified, their optimal placing in tunnels will be researched by simulation and the necessary sensibility due to the dilution of fire gases from the fire source to the sensor in the busy tunnel will be estimated. A real fire experiment in the test gallery will validate the simulation results.

This project has been executed by a consortium of three companies. The VSH Versuchsstollen Hagerbach AG is responsible for project lead and fire experiments. The Combustion Flow Solutions GmbH has been taken over the simulation of gas diffusion and the literature study. The Xirrus GmbH was responsible for gas analytics and sensor evaluation. ■

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