
Nanoporous hybrid silica films for selective VOC sensing through infrared spectroscopy

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Abstract

Styrene poisoning is one of the major hazard in the fiberglass processing industry, as this compound is classified by the International Agency for Research on Cancer as possible human carcinogen agent. The design of a sensor featuring a high selectivity towards styrene is therefore a crucial step to guarantee the safety of workplace atmospheres and assess worker exposure to one of the many harmful volatile organic compounds (VOCs). In this work, we explored the application of a nanoporous hybrid-silica film as the sensing layer for the detection of styrene through infrared spectroscopy. The films were analysed using FTIR spectroscopy to study the diffusivity of organic molecules inside nanoporous structures. The samples were at first exposed to an atmosphere containing a controlled concentration of styrene and then it was measured with real time FTIR to monitor the styrene desorption rate from the porous structure. Preliminary results show that the intensity of the styrene fingerprint peaks as measured inside the films is proportional to the styrene concentration in the atmosphere with a diffusion coefficient in the order of 10-16 m²/s.

Keywords: nanoporous materials, VOC, sensing, diffusion

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