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A porous xerogel as stabilizing matrix for phenol sensing in air and water

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Phenol and its derivatives are widely used in various industrial processes ranging from plastics manufacturing to drugs preparations. Phenol may also be produced by degradation of hydrocarbons under heating, exposure to light or through animal metabolism. This results in the presence of this toxic compound in the environment and thus the need for phenol detection in the field. The usual method for phenol air monitoring is based on adsorption-desorption of the pollutants on activated charcoal followed by delayed gas chromatography analyses. A low-cost direct alternative method, based on a functional porous material was investigated for the determination of the phenol pollution level.

Sol-Gel formulations based on silica precursors were optimized to obtain transparent crack-free colorless porous monolithic xerogels. Colorimetric reagents that would be incompatible in solution were stabilized into these xerogels allowing phenol-sensing monolith to be chemically stable for months. Upon exposure to phenol, the monolith color changed from pale yellow to red and the measured absorbance was directly related to the concentration of phenol. The sensor was exposed to phenol concentration ranging from 15 to 200 ppb to obtain a calibration curve. In addition, this low-cost phenol sensor proved to be able to detect phenol in air but also in water.

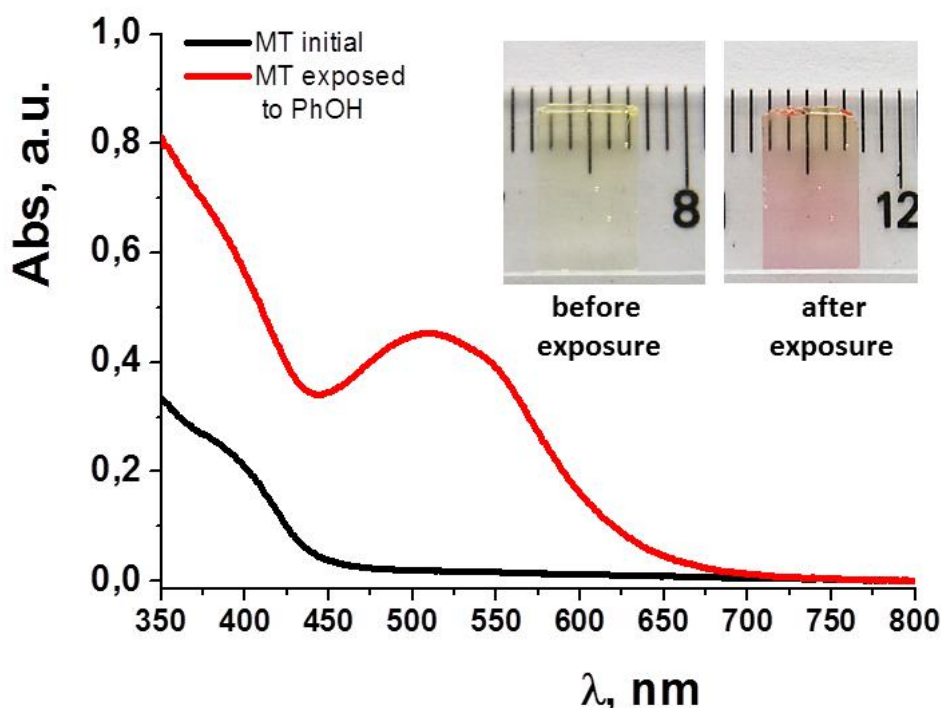


Figure 1. Absorption spectra of monolith before and after exposition to phenol.