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Simple Swedish device effectively reduces harmful indoor air pollution

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Indoor air quality can be significantly improved using a simple device which traps harmful chemicals emitted from glues, paints and building materials, a new study has shown. Designed in Sweden, the researchers demonstrate that the 'surface emissions trap', especially effective for damp buildings, also prevents emissions from mould and can remove unpleasant odours.

Volatile organic compounds (VOCs), such as formaldehyde, which can irritate the lungs and may cause cancer, can be emitted from building materials as well as glues and plasticisers used, for example, in PVC flooring. Damp buildings are particularly at risk from indoor air pollution as water can breakdown glue to release these VOCs, as well encouraging the growth of mould. Although replacing moisture-damaged material can reduce emissions, controlling the cause of the dampness might not always be feasible, for example if it is too costly to improve the ventilation in buildings.

This study describes a simple device to reduce emissions from damp building materials. The surface emissions trap is made by layering different materials into a cloth. A central adsorption layer and a breathable polymer sheet are protected top and bottom by a layer of polyester fabric. The cloth is placed directly on to a damp floor or wall and traps emissions from this surface while simultaneously allowing water vapour to pass through it.

The researchers tested the efficiency of the device in removing VOCs from PVC flooring in the laboratory and found it reduced total VOCs by 97%. Concentrations of formaldehyde were also reduced by 98.5% and the chemical 2-chloroanisole–which gives a musty odour–by 99%.

Furthermore, the researchers found that the efficiency of the trap was not impaired at different temperatures (30 and 40°C) or moisture levels (relative humidity levels 35, 60 and 85%). Artificially aging the emissions trap revealed that the device would still work efficiently after at least 10 years of use.

The researchers also tested the trap in a Swedish school built in the 1970s. Staff and pupils had complained about the poor air quality and the cause of the problem was identified as the PVC flooring that had been glued onto the concrete floor. Dampness in the building had been breaking down the glue, releasing VOCs.

The researchers stuck a total of 510m^2 of cloth to the floor (which was then covered with laminated flooring) in various rooms in the school building. The researchers took air samples and samples of the emissions trap to test for 2-ethyl-1-hexanol, the main VOC found before installation of the trap.

Two months after installation, levels of airborne 2-ethyl-1-hexanol had fallen from 6-7 µg/m^3 to 2 µg/m^3 and remained at this level after 13 months of using the emissions trap. Concentrations of the chemical increased in the trap from zero to 280 µg/g after 13 months of use, corresponding to only 1% of the capacity of the device. No mould was detected on the surface of the trap, laminated floor overlay or the PVC flooring. Furthermore, teachers reported that the disagreeable odour had disappeared within a few days of installation.

These results indicate that the device is an effective and easy way to improve indoor air quality, say the researchers, especially in buildings that have been affected by damp.