New green solvent could help clean our air

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French researchers have patented an eco-friendly liquid mixture that could help trap harmful pollutants from the air. The non-flammable solvent contains urea and choline salt, a common ingredient in chicken feed, says Leila Moura of the Unité de Chimie Environnementale et Interactions sur le Vivant in France. She is the lead author of a study in Springer's journal *Environmental Chemistry Letters*.

Harmful gaseous pollutants in the form of volatile organic compounds are often released into the air when chemicals are used, for example in cleaning products. From a human health and environmental perspective, it is therefore important to reduce the indoor and outdoor levels of these volatile organic compounds. Many methods have already been developed to clean contaminated air, for instance, liquid mixtures that can absorb and trap volatile organic compounds are often used. Although effective, many of the current methods can be quite expensive, toxic or even unstable.

In their aim to find an improved absorbent for cleaning the air, the researchers focused their attention on deep eutectic solvents. These mixtures have recently emerged as a greener alternative to many of the liquids that are often used to absorb volatile organic compounds. Deep eutectic solvents are made by mixing two compatible components together to form a resulting liquid product at room temperature. The melting point of a deep eutectic solvent is significantly lower than that of each of its individual components.

Laboratory studies were conducted to test how well each new mixture in

their liquid forms could absorb three harmful volatile chemicals. These were toluene, acetaldehyde and dichloromethane. The researchers measured their partition coefficients between the vapour and liquid phases for seven different deep eutectic solvents. A solvent based on choline chloride (an additive in chicken food) and urea was found to dissolve up to 500 times more harmful chemicals than is possible with water at 30°C.

According to Moura, there are many reasons why deep eutectic solvents should be considered when it comes to cleaning air. Their absorption ability is similar or even superior to those published for ionic liquids and organic solvents of similar purpose. She says that, in general, deep eutectic solvents are easier to prepare and more biodegradable than potentially toxic ionic liquids. Such solvents are also more biodegradable than the commonly used but more expensive silicone oils. Furthermore, in terms of recycling, the absorption capacities of the tested solvents remained unchanged during five reversible absorption-desorption cycles.

"They are cheap to produce, are often made of naturally occurring chemicals, are recyclable, non-flammable and mostly biodegradable," says Moura. "Consequently, these solvents could be an ecological alternative to the conventional absorbents."

More information: Moura, L. et al (2017). Deep eutectic solvents as green absorbents of volatile organic pollutants, *Environmental Chemistry Letters* DOI: 10.1007/s10311-017-0654-y

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