Newly created liquid captures sulphur dioxide emissions

A new liquid has been designed to selectively capture sulphur dioxide emissions, one of the primary causes of acid rain. The capture process is reversible so the sulphur dioxide can be released at a later stage. This means, for example, that sulphur dioxide could be captured from power plants and reused later in other industrial processes.

As well as causing acid rain, which harms land and water ecosystems, sulphur dioxide also contributes to fine particle pollution. The gas can cause respiratory problems and some people, such as those with asthma, are particularly affected.

Sulphur dioxide emissions are mainly produced by the combustion of fossil fuels. Coal-burning power plants, for example, release significant amounts of sulphur dioxide (along with other gases, such as carbon dioxide) in their flue gases. Currently, sulphur dioxide is captured and removed from flue gases using corrosive solutions of lime or caustic soda. Sometimes the resulting sulphurous waste has to be disposed of in landfills.

The researchers designed and synthesized a new molecule which reacts with sulphur dioxide to form a liquid at room temperature, containing up to 35 per cent (by weight) of sulphur dioxide. The process is reversible and the sulphur dioxide-rich liquid can be returned to its original form by heating it to 70°C in a vacuum. This removes the sulphur dioxide which can be recovered and used for other purposes, for example, as an additive in the cement industry.

The new molecule, N,N-dibutylundecanolamine, or DBUA, is a liquid before and after reaction with sulphur dioxide. It would therefore be relatively easy to move the bound sulphur dioxide from where it was captured to where it could be removed. The DBUA could be then returned and reused. The researchers suggest DBUA can be recycled indefinitely, provided it does not come into contact with moisture.

As it is likely that fossil fuels will continue to be used as an energy source for some time, the new liquid could replace the current chemicals used to remove sulphur dioxide from flue gases. Using DBUA would be more environmentally friendly, energy efficient, less corrosive and the liquid is recyclable. In addition, DBUA binds sulphur dioxide but not carbon dioxide, suggesting that the selective desulphurisation of flue gases is possible.


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