

Supramolecular solvents for the screening of emerging contaminants in indoor dust by LC-HRMS

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The chemical safety of materials is an issue of emerging social concern and many additives present in consumer products are suspected to cause environmental and health problems. We spend most of our times indoors in offices and homes where levels of organic contaminants coming from products reach high levels and can pose a risk to the human health. Indoor dust is a common pathway of exposure to chemicals and it has been reported to contain a complex mixture of organic contaminants such as phthalates, flame-retardants, bisphenols and perfluorinated compounds. In order to control the quality and safety of materials of daily use, rapid analytical methods that can cover a wide range of contaminants, are required, so that emerging and potentially toxic compounds are not overlooked.

In this study, we investigate the use of supramolecular solvents (SUPRAS) for the analysis of emerging contaminants in indoor dust using liquid chromatography coupled with time-of-flight mass spectrometry. SUPRASs are nano-structured liquids made up of three-dimensional aggregates generated from amphiphiles through a sequential, self-assembly process. SUPRAS can provide the advantage of wide scope extraction capabilities and simplicity. The different polarity regions in the supramolecular aggregates provide excellent solvation properties for a variety of compounds and multiligand ability through the multiple polar groups present in the aggregate. These solvents are therefore ideal for screening purposes, covering the extraction of a wide range of contaminants with the simultaneous exclusion of the main matrix interferents (e.g. proteins, polymers, humic acids, etc.) due to their restricted access properties. The potential of SUPRAS for screening of organic contaminants will be for the first time investigated in this project. Initial results obtained by using a decanol-based SUPRAS and liquid chromatography coupled with high resolution time-of-flight (TOF) mass spectrometry shows that compounds in a wide polarity range are efficiently extracted and detected by suspect screening, e.g. pesticides, perfluorinated compounds, phthalates, parabens, lubricants and plasticizers, etc. Typically main matrix interferents, e.g. humic acids, proteins, polymers are excluded from the SUPRAS due to their restricted access properties. These properties together with the low amount of solvent used for extraction (around 500 μ L) allowed pretreatment/extraction/concentration in a single step, this saving time and consumables with respect to standards protocols.

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