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Automated thermal desorption-gas chromatography/mass spectrometry for rapid screening of hazardous chemicals in clothing and other textiles

ABSTRACT

Common clothing garments and other textiles on the European market have been shown to often contain numerous and high levels of, so far mostly non-regulated, but likely hazardous chemicals. Textile chemicals, non-covalently bound to the textile fibres, may migrate through sweating or rubbing and be absorbed by human skin, thus constituting a possible risk for skin sensitization or other health effects. For prevention purposes, the control of clothing and other textiles for such chemicals must therefore be improved.

An automated analytical method has been developed and is suggested as a fast method for control and comprehensive screening of semivolatile hazardous chemicals in textiles. This method is based on automated thermal desorption– gas chromatography/mass spectrometry (ATD-GC/MS) and has so far been evaluated for synthetic polyester textiles, cotton as well as blends of these fibres.

The method requires very little of manual handling, no solvents and a minimum of consumables. The total run time for each sample is around 40 min, including thermal desorption, chromatographic separation, and mass spectrometric detection. For most of the studied analytes, the method quantification limit in full scan acquisition is well below 5 ppm, sufficiently low for screening of textile chemicals regulated by EU.

Keywords: Textile chemicals, automated thermal desorption-gas chromatography/mass spectrometry, skin sensitizers, hazardous chemicals

BIOGRAPHY

Ulrika Nilsson, professor in analytical chemistry, is leading the research of the ChemInTex group in the Department of Chemistry at Stockholm University. She has a long experience of developing mass spectrometric and chromatographic techniques for both environmental pollutants and health hazardous chemicals, with a special interest in skin sensitizers.