

Investigation of triaryl and trialkyl phosphates in particle deposits in an air filter of a public transport aircraft

W. Rosenberger, R. Wrbitzky, M. Bader  
Institute for Occupational Health, Hanover Medical Institute

The potential health risk to flight crew and passengers in public transport aircraft is currently a subject for public discussion by occupational health specialists. So-called Aerotoxic syndrome, which has similar symptoms to Multiple Chemical Sensitivity (MCS) is suspected to be caused by exposure to tricresyl phosphates. This substance is added to turbine engine oil and can get into the cabin via the bleed air.

The aim of this study was the qualitative and quantitative analysis of the range of organophosphates (OP) in particulate form in the cabin air of a public transport aircraft, through analysis of an air filter from an air conditioning unit. The HEPA filter (High Efficiency Particulate Air filter) that was analysed had been in operation for a period of 5900 flight hours.

On the intake side, the filter element was covered in an inhomogeneous layer of dust, several millimetres thick. The metal frame was covered in a thin layer of homogenous dust. On the clean side there was practically no deposit. The identification of triaryl and trialkyl phosphates in the deposited dust (mass reference, area reference) was performed after extraction with dichloromethane by GC-MS with isotope dilution analysis. Triisobutyl, tributyl, tris (chloroethyl), tris (chlorisopropyl), tris (1.3 dichlorisopropyl), triphenyl, tris (butoxyethyl), diphenyl-2-ethylhexyl, tris(ethylhexyl) and tricresyl phosphate (m- and p- isomers) were detected and quantified in the filter dust.

The concentration of the individual OPs was in the range 0.03 – 43.2 mg/kg and the surface load was 0.8 – 967 µg/m<sup>2</sup>. The total concentration and surface load of OPs was 168 mg/kg and 1100 µg/m<sup>2</sup> respectively. The main components identified were diphenyl-2-ethylhexylphosphate and the tricresyl phosphate isomers.

During the analysis of the air filter, 11 different organophosphates were identified. Quantitative information, for example, in terms of engine oil as a source of the contamination, and the exposure situation in the aircraft or the toxic exposure to the cabin crew or passengers can not be directly deduced.

In addition to identifying the source of contamination, air sampling and biomonitoring studies should provide information on the level of exposure and possible health hazards to exposed persons.