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RISK ASSESSMENT OF VOLATILES RELEASE FROM POLYMERS AND FLAME RETARDANTS USING OFF LINE AND ON LINE TA METHODS

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The information about the composition of fire gases or fire effluents resulting from burning processes or even thermal treatment of organic products is nowadays gaining more and more interest with regard to problems concerning the environmental protection respectively environmental pollution. For this purpose it is necessary to find suitable methods for the determination of the thermal properties and for the analysis of the decomposition products.

Simultaneous thermal analysis mass spectrometric investigations and off-line combustion experiments were carried out on different fire retardants and fire protected polymers. The sample materials were commercially available products like polyvinylchloride floor coverings (PVC), polyurethane foam from car seats (PU), PVC cable coatings and PU insulating foam and a series of selected fire retardants, for example: decabromodiphenylether (DBDPE), tris-(β-β'dichloroisopropyl)-phosphate (TDCP), tris-(β-chloroisopropyl)-phosphate (TCPP), tris-(β-chloroethyl)-phosphate (TCEP), dimethyl-methylphosphonate (DMMP), diethyl-N,N-bis-(2-hydroxy-ethyl)aminomethyl phosphonate (DAMP).

TA/MS Equipment and measuring conditions:

The thermal analysis/mass spectrometric analysis system consists of a Netzsch STA 429 Thermal Analyzer and a Balzers QMG 511 Quadropule Mass Spectrometer. Two specially arranged ceramic tubes were used for realizing the pressure drop from ambient pressure up to 10^{-3} Pa to permit the simultaneously recording of the mass spectra.

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The applied heating rate was 10 K/min in argon and in air atmosphere. The MS data were processed by a digital Equipment PDP 11/23 + Microcomputer. The operating system was RT 11 and the programming language Fortran IV. The software was self developed. TG and DSC Equipment and measuring conditions: The TG and DSC measurements were performed with a Perkin-Elmer TAG 7 Thermogravimetric Analyzer and a DSC 7 Differential Scanning Calorimeter in air and in nitrogen atmosphere. The TGA 7 instrument was directly coupled with an adsorption device. As an adsorbent we used self prepared XAD-4 tubes and for the desorption acetone.

Combustion apparatus:

The samples were burnt in a so-called VCI combustion apparatus. The degradation products were adsorbed, desorbed by a solvent and analyzed by high resolution GC/MS.