

Techniques for Understanding Fire Retardant Behaviour: Molecular Degradation and Decomposition Schemas

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Analyzing the decomposition gases of polymers and qualifying the decomposition products are essential for the understanding of the thermal behaviour and the molecular mechanisms of polymers. Therefore analyzing techniques like thermogravimetry (TGA) coupled with Fourier transformed infra red spectroscopy (FTIR) or mass spectrometry (MS) are used. The methods work excellent for small decomposition products, such as CO₂, H₂O, NH₃ or CH₄ or hydrocarbon decomposition products with a high symmetry and therefore unambiguous vibration spectra. However, when complex mixtures of hydrocarbon decomposition products are released to the gas phase, the results of these methods are hard interpret because of overlapping signals.

We developed a new method that is easy to handle for the analysis of complex decomposition gaseous mixtures during TGA experiment. The volatiles are trapped on stir bars with an adsorption material on the surface (SBSE, Twister). Afterwards the Twister will be analyzed with thermal desorption gas chromatography mass spectrometry (TDS-GC-MS). Through the chromatographic system the volatiles can be separated and easy qualified via MS data base.