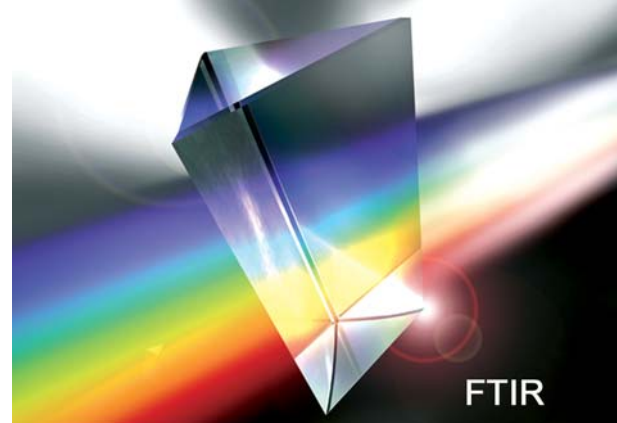


Application Note

Brominated Flame Retardants (1)

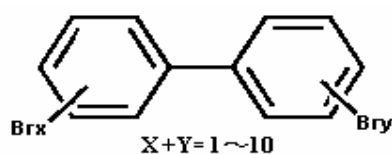
FTIR determination of brominated flame retardants following the rules of RoHS and WEEE using a single reflection accessory



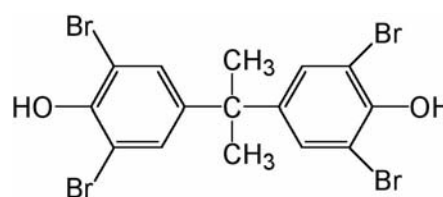
The RoHS* (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment) norm will restrict the use of brominated flame retardants for electrical and electronic parts in July 2006.

Result will be that the use of PBB and PBDE as flame retardant in polymers is not allowed or the concentration of it should not be higher than 1000 ppm.

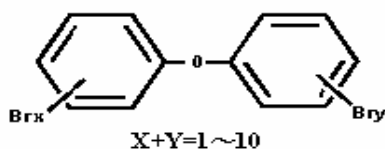
Schematics of some brominated flame retardants



PBB



TBBPA



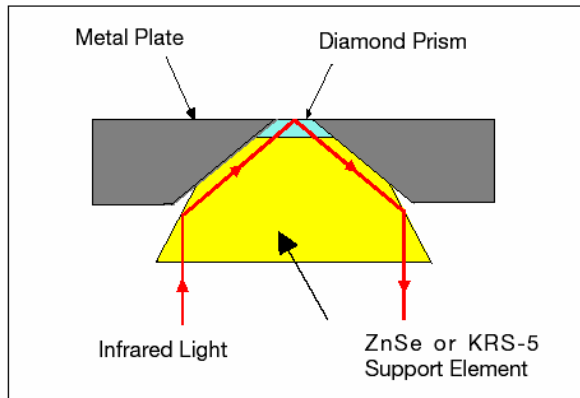
PBDE

Fig. 1: Presentation of chemical structures related to brominated diphenyls

RoHS regards as hazardous for human the substances PBDE Pentabromo diphenylether (PentaBDE) and Octabromo diphenylether (OctaBDE). OctaBDE is used with polymers made from ABS and PS. The main flame retardant in use nowadays is the DecaBDE which is investigated in the polymers: PS, PE, ABS and Polyester.

Target of this application is to show that the FTIR-analysis technique is an ideal tool for the identification of polymers and flame retardants. A specific characteristic is, that the sample material can be used without any act of destroy. The investigation of a wet chemical treatment is not necessary.

Principle of the Single Reflection ATR-Accessory



DuraSamplIR II Optics

Fig. 2: Schematics of the lightbeam through the support element and the diamond prism



Exterior of System I (High-Pressure Device Type)

Fig. 3: Presentation of the used ATR-Accessory, the sample will be pressed with the pressing device to touch smoothly the diamond (see Fig.2).

Measurement and Analysis of the Infrared Spectra

The quick and simple analysis of polymers is possible because all polymers and flame retardants have a specific infrared spectrum.

In the following sample of Polystyrene PS are shown three spectra related to DBDPE, PS with DBDPE and pure PS. By the marking of the Fingerprint area it is visible that the identification of DBDPE in Polystyrene is possible (Fig. 4)

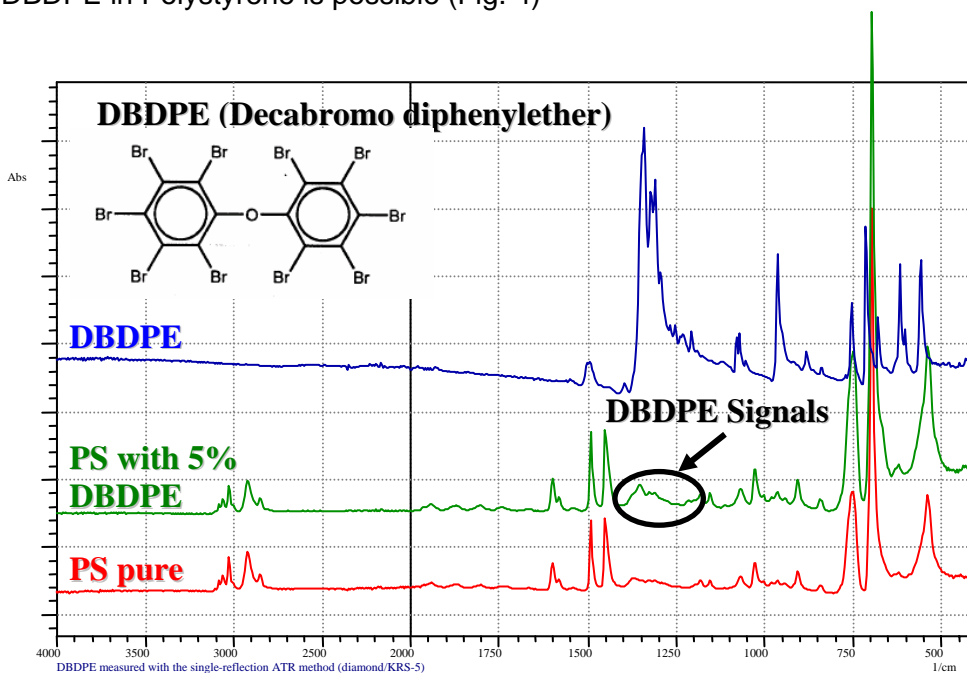


Fig. 4: Infrared spectra of polystyrene and polystyrene including flame retardant

Instrumentation:

FTIR: IRPrestige-21

Software: IRsolution

Accessory: DuraSampler II with KRS-5 Element and Diamond Prism