BUCK Scientific

Application Note #GC3011

Differentiating Polychlorinated Biphenyls (PCB's) by GC / FID / ECD

The analytical chemistry of PCB's is rigorous, demanding the highest quality in sample preparation and analytical technique. Insufficient sample extraction and inappropriate methods of sample clean-up are the most common sources of error in PCB analysis, which causes significant interference in the chromatography. However, even in relatively clean samples the problem remains to confidently distinguish PCB's from other compounds in the sample. Since PCB's are extremely complex mixtures of congeners, they are identified based on the presence and proportion of certain congeners (209 of which are catalogued in the Ballschmitter & Zell numbering system), and by the manufacturer trade name (i.e.; Aroclor, Kanechlor, etc.).

Short of GC-MS, the highest level of confidence possible in identification is obtained using a confirmational column. Systems like the Buck System P gas chromatograph, equipped with EPC split / splitless injector and dual EC detectors, are designed specifically for this purpose and provide for a high level of accuracy. The injected sample is split simultaneously onto two columns of different polarity and each compound is then identified based on the shift in retention time. The drawback to these systems is that they are relatively more expensive, and calibrations are tedious and time consuming. However, for labs analyzing high volumes of samples, or where positive identification for legal or regulatory purposes is required, this is the system of choice.

In most cases, an appropriate trade-off is necessary between absolute identification and cost. This is especially true for mobile labs, or labs involved in many different types of projects, where operating funds cannot be tied up in instruments dedicated to a single purpose. They need to have the flexibility to analyze a broad array of compounds in short time periods, and so other techniques must be used.

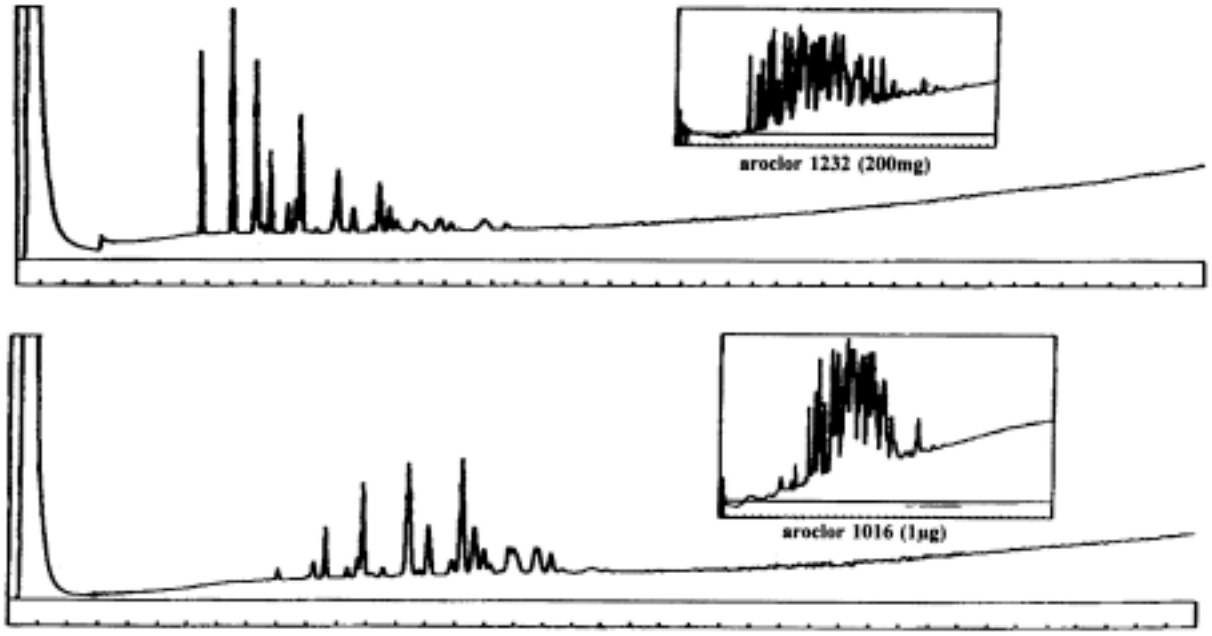
A simple, rapid technique for analysts gaining experience with PCB analyses utilizes the selectivity of the FID compared to that of the ECD. Although the FID is nearly a universal detector, it has a differential response towards different classes of compounds. In addition, FID response is a function of the total mass of each compound, rather than on concentration, so that it responds to PCB's in a way that is both characteristic of the particular PCB mixture, and also quantifiable based on selected members of the group. The FID provides cleaner PCB profiles and easy identification of BZ congeners.

Continued on reverse …..

SIC: 131, 132, 1382, 1389, 494, 4952, 4959, 5171, 8711, 8734, 8742, 8744, 951

Differentiating Polychlorinated Biphenyls (PCB's) by GC / FID / ECD

In the attached chromatograms, two closely eluting *Aroclor's*, 1016 and 1232, are analyzed simultaneously by FID / ECD. The ECD fingerprint is shown in the inset on each chromatogram. The FID simplifies the profile of each Aroclor with easily distinguished, recognizable patterns. By utilizing both detectors simultaneously, the analyst can rapidly identify PCB's and estimate their concentration based on the quantity of the major congeners. This approach, when validated by data from the ECD, can be used for quick field screening where the sources of contamination are known. As the lab and analyst gain more experience, this technique can be used to verify tentative data.



BUCK Scientific

1-800-562-5566

58 Fort Point Street East Norwalk CT 06855
Tel: 203-853-9444 Fax: 203-853-0569
www.bucksci.com sales@bucksci.com