AT-Column; A Novel Concentrating Technique for Large Volume Injections in Gas Chromatographic Analysis of Labile Pesticides

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Introduction

In recent years, many studies have been reported in which the large volume injection methods have been employed for the GC determination of trace analytes. Large volume injections have three major advantages: 1) higher sensitivity, 2) some sample preparation stages can be eliminated, and 3) good technique in hyphenation. Typical large volume injectors are the programmable temperature vaporization (PTV) injector and the cold on-column (COC) injector. However, both injectors have some disadvantages. The PTV makes use of a packed liner. Some compounds are decomposed due to the packing material, and other compounds are too strongly retained on the packing, that, consequently do not desorb. The large volume COC technique needs a long pre-column and the injection speed of the auto sampler should be precisely controlled. The new AT-column, injection technique is based on a PTV injector, without packing material in the liner. Due to this, compounds of interest are not decomposed or too strongly retained in the injector. Consequently, there is no need for a long pre-column and the precise control of the injection speed is not required. AT-column combines the advantages of PTV and COC resulting in a user-friendly, flexible and robust injection system.

Theoretics

A special designed wide bore liner is placed in the PTV injector body. The outlet of the liner is connected to the capillary column via a short line of de-activated fused silica. The de-activated fused silica line is fitted to the liner by a press-fit connection in the bottom of the liner. The evaporated sample solvent is vented via a side hole in the wall of the liner.

Active compounds

To test the degradation behaviour of the AT-column large volume injection technique in comparison to conventional PTV large volume injections is a 0.1 ng/µl standard solution prepared of dichlorvos, bendicarb, carbaryl, methiscarb, endrin 4,4'-DDT, 4,4'-DDD, 4,4'-DDE and ecosene. From this standard solution a 100-µl injection is analyzed with both AT-column injection and conventional PTV large volume injection with a liner packed with a special treated chromosorb-based material. A 100 times stronger solution was used to perform COC reference injections.

Conclusion

From the results it can be concluded that the AT-column large volume injection technique is an additional and power full technique to the PTV large volume injection and the on-column large volume injection with early vapour exit. The AT-column technique combines the user-friendly, flexibility and robust behaviour of the PTV injection with high inerts as there is no need for any packing material in the injector, which is a big advantage of on-column injections. The AT-column technique shows linear and reproducible results and can be used with a wide range of solvents. Due to the combination of the advantages of both PTV and on-column has AT-column an enormous potential in the field of large volume injection techniques for gas chromatography, but will never replace PTV or COC.