

REDUCING MASS DISCRIMINATION BY OPTIMIZATION OF THE LINER QUARTZ WOOL POSITION

Dan DiFeo Jr. — SGE, Incorporated. 2007 Kramer Lane, Austin, Texas 78758, USA.
 Angus Hibberd, Gerard Sharp — SGE International Pty. Ltd. 7 Argent Place, Ringwood 3134, Australia.

INTRODUCTION

A problem common to split/splitless injectors is mass discrimination. This is defined as the unrepresentative sampling from the injector to the column of low and high molecular weight components. High mass discrimination is a result of poor transfer of semi-volatile compounds from the flash vaporization liner (for example, in split or splitless injection) to the capillary column. High molecular weight discrimination will result in a loss of sensitivity. A problem with mass discrimination is that in most cases, the problem is undetected. If the application involves only compounds which elute at higher temperatures (i.e. lower volatility compounds), poor response will often be attributed to causes other than mass discrimination. In some cases, the analyst will not even be aware that sensitivity could be improved.

QUARTZ WOOL

Quartz wool in the inlet liner has many benefits. The quartz wool acts as a filter for the expensive analytical column by preventing non-volatile material entering the column. The location of the quartz wool in the liner is also important. The quartz wool needs to be positioned so that the liquid sample is wiped away from the needle during the injection process. This positioning greatly improves reproducibility. For example, precision from a repetitive set of injections can improve from 5-10% (typical for an external standard calibration) to less than 1%. Quartz wool in the inlet liner provides a third benefit. The wool increases the surface area of the liner and therefore increases the evaporation rate of the

liquid sample mixture. Rapid vaporization results in good mixing of the vapors and decreases mass discrimination.

The advantage of the SGE FocusLiner™ is that the tapered sections prevent the quartz wool moving either in an upward or downward direction (Figure 1). This is a necessity for mass discrimination prevention. The injection of the liquid sample onto the quartz wool increases the surface area for improved volatilization. This reduces mass discrimination by ensuring all compounds have been converted into the gaseous phase before transfer to the column or the split vent. If the quartz wool moves away from the optimum position, the effectiveness of equal compound transfer is reduced.

RESULTS

The best way to show the result of mass discrimination is to analyze a series of compounds from low to high molecular weight (i.e. from high volatility to low volatility). For this reason, a mixture of hydrocarbons was analysed (a TPRH standard, Total Recoverable Petroleum Hydrocarbons) used in an environmental analysis (Figure 2). A comparison was made between a liner containing quartz wool located at the bottom of the liner (near the column, Figure 3) to the SGE FocusLiner (Figure 1). For the hydrocarbon C34, it is clear that the response is better with the FocusLiner than with the standard liner. The peak height response in Figure 2b is twice that of Figure 2a when using the FocusLiner. In this case it is easy to detect the difference in responses but if C34 was analyzed in isolation, the reduced response for the standard liner would have gone unnoticed.

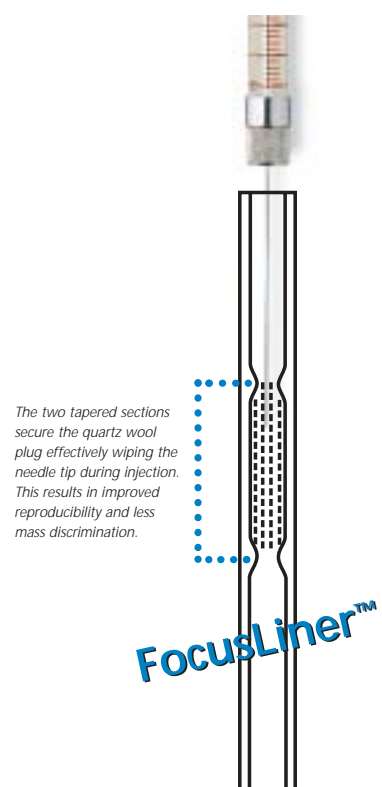
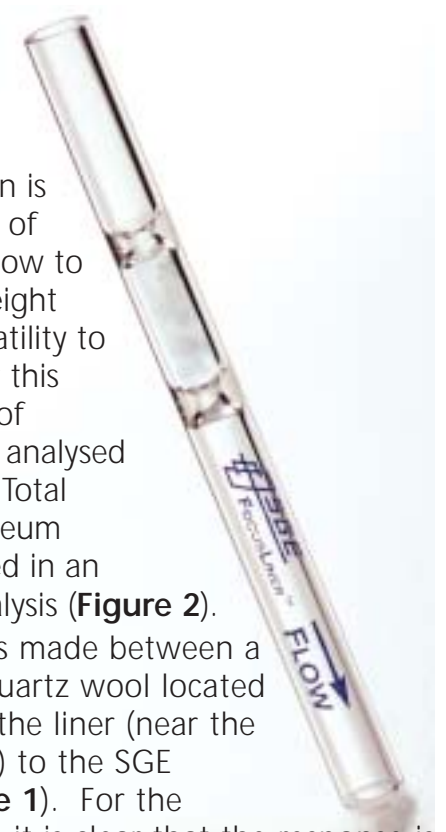


Figure 1. The SGE FocusLiner™ showing the two tapered sections containing the quartz wool.

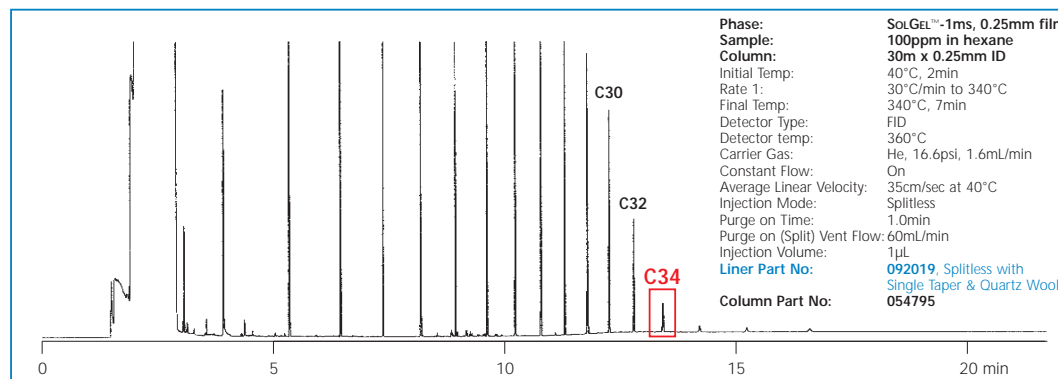


Figure 2a. A series of aliphatic hydrocarbons (TPRH standard) analyzed using a standard inlet liner containing quartz wool, Part No. 092019 (see Figure 3).

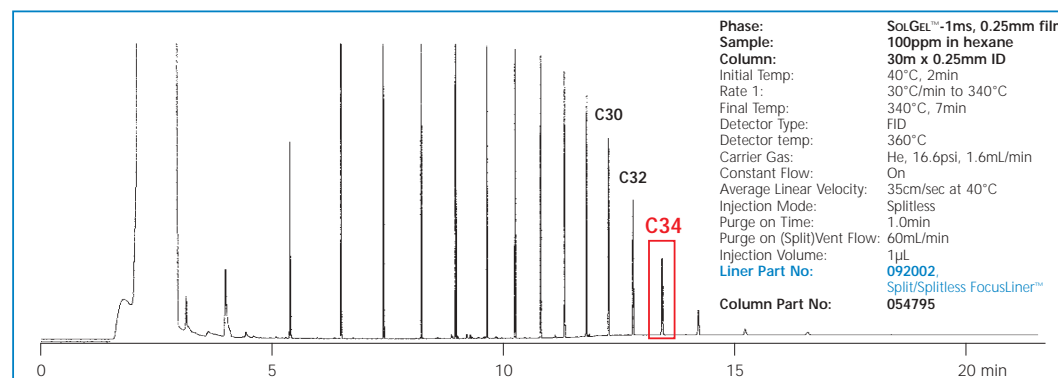


Figure 2b. A series of aliphatic hydrocarbons (TPRH standard) analyzed using a SGE FocusLiner™ with the wool contained between two baffles. Note: the increased response for C34.

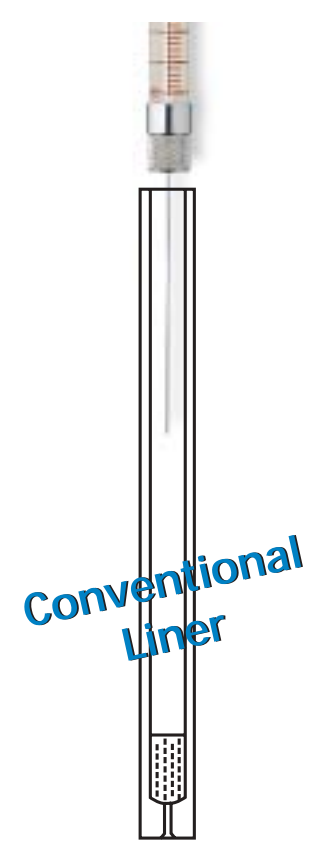


Figure 3. Standard inlet liner showing the quartz wool away from the optimum position.

CONCLUSION

The SGE FocusLiner markedly reduces mass discrimination in high molecular weight samples. The FocusLiner is a quick, simple and cheap way to improve sensitivity for lower volatility compounds.

