Evaluation of the Effects of Heating Profile and Modulation Period on a Resistively-Heated Thermal Modulator for GC x GC

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Background

GC x GC is a relatively new technique that is achieving greater popularity by allowing researchers to obtain much more information than was previously possible. This technique utilizes two columns and two detectors to achieve greater sensitivity and to capture the more polar compounds, thereby allowing researchers to better separate a wide range of compounds. While this technique is promising, there are still many unknowns that must be solved before it can be widely adopted. The objective of this study is to investigate the effect of heating profile and modulation period on the performance of a thermal modulator, so that future researchers can better understand the limits of this technique.

Experimental Parameters

Table 1: Thermal Modulator & GC Parameters

- Column Length: 30 m x 0.25 mm ID
- Column Temperature: 100°C
- Oven Temperature: 100°C
- Temperature Program: 10°C/min to 250°C
- Flow Rate: 1 ml/min
- Injection Volume: 1 µl
- Detector: Flame Ionization

Figure 3: Thermal Modulator Design

Figure 4: Modulated response peak

Figure 5: Headspace P/PIVH vs. Modulation Period

Figure 6: Headspace P/PIVH vs. Modulation Period

Figure 7: Chromatogram of the test compounds

Figure 8: Comparison of the test compounds

Figure 9: Comparison of the test compounds

Conclusions

The results indicate that a higher P/PIVH value is obtained with a longer modulation period. This suggests that the thermal modulator is more effective in separating the compounds when the modulation period is longer. Future research should focus on optimizing the heating profile and modulation period to achieve the best separation and sensitivity possible.

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References

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