Varian 385-LC

Overcoming Compound Volatility with Sub-ambient ELSD

Advantage Statement: The Varian 385-LC is an advanced evaporative light scattering detector from Polymer Laboratories, now a part of Varian, Inc. The Varian 385-LC delivers sub-ambient evaporation down to 10 °C, providing maximum sensitivity for compounds with significant volatility below ambient temperature. The instrument benefits from fast data output rates and extremely low dispersion for fast LC, and delivers a universal response down to the low-nanogram range for truly representative analysis. Reproducibility is less than 2 % for improved consistency of results. The Varian 385-LC offers real time gas management that eliminates solvent effects to give a constant response across a gradient. Control and digital data collection come as standard for multi-vendor platforms and so there is no need for an analog to digital converter. On-the-fly adjustment of light source intensity saves time during a run, too - all this in the smallest footprint around. Being complementary to LC/MS, and offering unrivalled flexibility and sensitivity, the Varian 385-LC is the ELSD of choice for the most demanding applications.

The success of ELS detection relies on evaporating the eluent without destroying the analyte particle. Where the analyte is non-volatile, evaporator temperatures of 50-100 °C can be used without compounds degrading, thus giving maximum sensitivity. However, when compounds have high vapor pressures and the eluent has a high boiling point (eg water), detection of semi-volatile compounds is problematic, because the evaporation temperature needs to be set at 30 °C or above in order to evaporate the aqueous solvent.

Most of today's ELSDs are only capable of evaporating aqueous eluents at 30 °C, or above, but for low molecular weight, low boiling point compounds even 30 °C is too high, and these compounds will be destroyed in the evaporation process, resulting in poor sensitivity.

To improve the detection of thermally sensitive compounds, evaporation at sub-ambient temperature is required. However, evaporating water at increasingly lower temperatures requires exponentially longer evaporation times. Therefore, temperature alone cannot be used to evaporate water at sub-ambient temperature.

The Varian 385-LC has been specifically developed to operate at sub-ambient evaporation temperatures, using a Peltier cooled evaporation tube. The removal of solvent is achieved using a secondary stream of dry nitrogen gas that is added at the evaporation stage. When the evaporation temperature is lowered below ambient temperature, the "evaporation gas" is increased to compensate. At higher evaporation temperatures, the evaporation gas can be reduced or even turned off, to maximize signal-to-noise ratios. Using this sub-ambient technology, eluent can be evaporated as low as 10 °C.

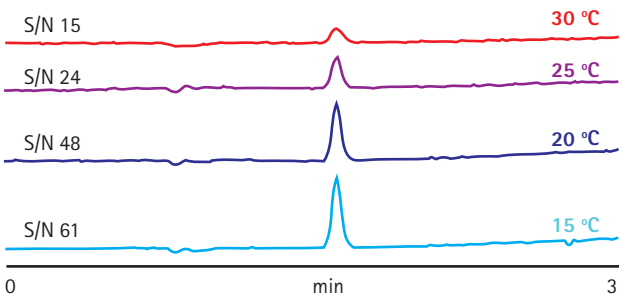

Figure 1. Improved detection at sub-ambient temperatures using the Varian 385-LC.

The benefit of using sub-ambient ELS detection is demonstrated in Figure 1, where the signal-to-noise of a semi-volatile pharmaceutical compound (MW 135) increases four-fold at 15 °C compared to 30 °C. Sub-ambient ELSD at 20 °C not only increases the number of semi-volatile compounds detectable by ELSD, but also minimizes any response variation between compounds due to volatility differences. Consequently, sub-ambient ELSD can improve the accuracy of compound quantification and uniformity of response.

Conclusions

In the past, quantification and purity measurements using evaporative light scattering detection showed poor accuracy due to compound volatility and response variation across a solvent gradient. However, sub-ambient ELSD at 20 °C, as delivered by the Varian 385-LC, increases the accuracy of measurement by minimizing compound volatility effects.

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