A comparison of CAD and ELSD as non-UV detection techniques

Evaporative Light Scattering Detectors (ELSD) and Charged Aerosol Detectors (CAD) are widely accepted to be universal detectors. Both detectors can be used to analyse a wide variety of analytes as they are considered to measure bulk properties or generic attributes of molecules.[1] Both techniques provide responses that are independent of extinction coefficients or ionisation; responses are related to the concentration of analyte.[2] CAD and ELSD employ similar methods of nebulisation however they differ on detection. This difference in detection gives rise to variation in sensitivity and accuracy.

ELSD and CAD are compatible with all chromatographic instruments, on both an analytical and preparative scale. Both are applicable to compounds which are less volatile than the mobile phase of the chromatographic method used.[2,3]

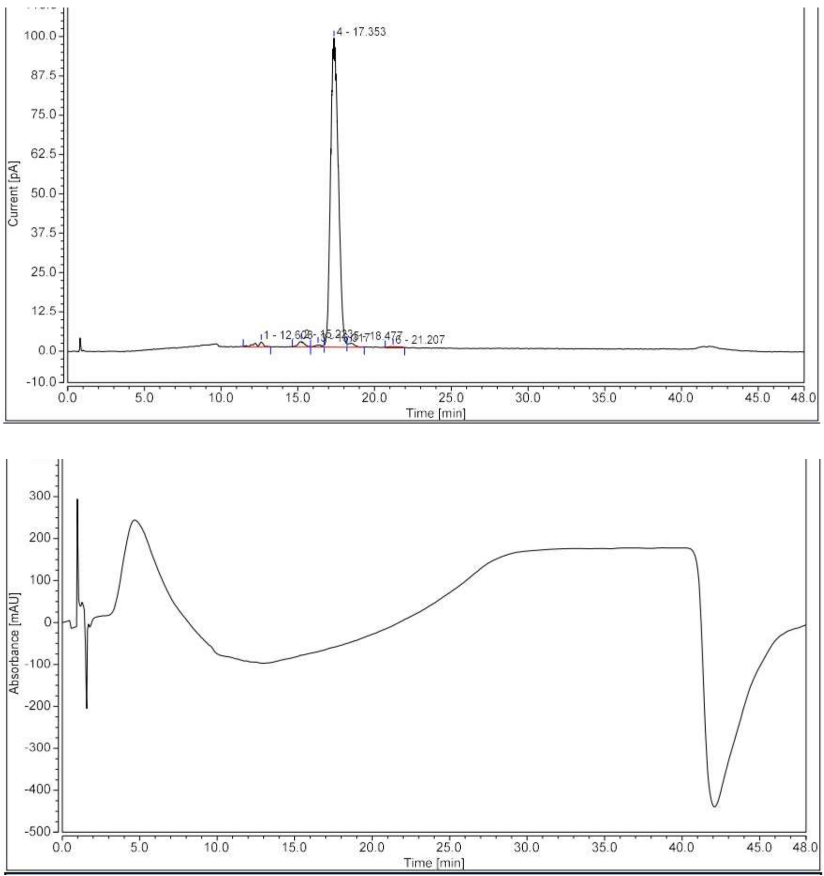

Figure 1 : CAD (top) and UV (bottom analysis of the same analyte, which has no chromophore. The CAD data shows a clear main species, along with minor impurities, whilst the UV data shows no response.

Evaporative light scattering detection

This mode of detection works through nebulising the eluent into droplets suspended in a gas stream and evaporating residual solvent from the droplets. The analyte particles flow into the detector, where their presence is detected through the scattering of a beam of light. The ELSD output is dependent on the light scattered. Large particles result in more scattering and a high signal intensity; however, this is related to particle formation during desolvation rather than analyte mass.[2]

Charged aerosol detection

CAD requires solutes to be nebulised and dried into analyte particles using a similar method to that of ELSD. The primary gas stream is met by a secondary gas stream that is positively charged. Charge is transferred to the analyte particles, which are directed to and detected by an electrometer.[3]

Unless isocratic conditions are used, the response from ELSD and CAD is not linear, as nebulisation and particle formation is dependent on mobile phase composition which varies with time during an eluent gradient. Sensitivity is affected by the solvent used and drying conditions.[2]

Both detection techniques discussed are useful in a chromatographic setting and offer advantages over UV and MS as they are universal detectors. However, CAD is inherently more applicable than ELSD due to improved sensitivity. Charged aerosol detection can be used for majority of particles formed (including those with diameters less than 100 nm), whereas evaporative light scattering detection cannot.[4]

Reach Separations uses both CAD and ELSD to support projects from clients throughout the chemical industry. We have found CAD to be a useful tool for the analysis of lipid projects and other non-UV active molecules. We have also invested in a prep compatible ELSD to aid our purification of these compounds.

1 *HPLC Analysis of Nonvolatile Analytes Using Charged Aerosol Detection. LC-GC North America. 23.*
2 *2424 Evaporative Light Scattering Detector Operator's Guide. 71500121802/Revision B*
3 *Charged Aerosol Detection in Pharmaceutical Analysis: An Overview. LCGC Supplements, Special Issues-04-03-2009, Volume 27, Issue 4, 40–48*
4 *Dixon RW, Peterson DS. Development and testing of a detection method for liquid chromatography based on aerosol charging. Anal Chem. 2002;74(13):2930-2937.*

marketing@reachseparations.com

Reach Separations, BioCity Nottingham, Pennyfoot Street, Nottingham, NG1 1GF | 08455 275060
www.reachseparations.com