



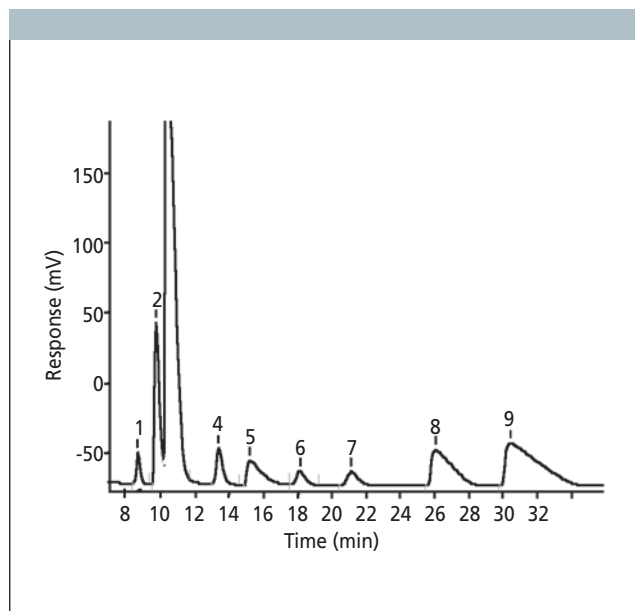
# Determination of Cations and Amines by Non-Suppressed Ion Chromatography

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Ethanolamines are widely used in power industry cooling waters as carbon dioxide scrubbers. It is also used for the production of emulsifying agents, for gas purifications (for the removal of acidic components), and as corrosion inhibitors. Carryover of amines from scrubber units into waste streams can cause severe problems in refinery waste-treating pools. Different amines are sometimes used in different production areas to make it easier for plant operators to locate sources of amine contamination. It is now possible to easily and rapidly analyze amines by Non Suppressed Ion Exchange Chromatography without gradient.

## Experimental Conditions

A Metrohm Modular Ion Chromatographic system is used for the analysis. Model 819 conductivity Detector, 818 Dual piston IC Pump, 838 Auto sampler, 820 IC Separation center and IC-Net 2.3. A MetroSep C2 (4 × 250) column is employed for separation of common cations and ethanolamines in a single isocratic analysis. Most importantly, direct conductivity is employed for the analysis. Excellent sensitivity and simplified operation is the greatest benefit of direct conductivity i.e. One less step for maintenance (suppressor) Eluent = 4 mM/L Tartaric Acid + 0.45 mM/L PDCA + 0.05 mM/L Crown ether (18,6) with Flow rate of 1.0 mL/min.



**Figure 1:** Separation of common cations and ethanolamines. Peaks are 1. Sodium, 2.  $\text{NH}_4^+$ , 3. MEA, 4. DEA, 5. Potassium, 6. TEA, 7. MDEA, 8. Calcium, 9. Magnesium

## Results and Discussion

Figure 1 is a demonstration of lean industrial scrubber water containing 30% MonoEthanolamine (MEA) and low level of other amines and cations. Calcium, Magnesium, and TEA was spiked in the sample to indicate their respective retention times. Sample was diluted 1000 fold prior to injection. It also clearly demonstrates the separation of ethanolamines and common cations. This separation was achieved using a C2 column with capacity of 194  $\mu\text{mol}$  (K+) Metrosep C2 columns is Silica-based cation exchanger, comprised of poly (butadiene-maleic acid) copolymers. Another advantage of these columns is that organic solvent like Acetone or Acetonitrile can be used. Separation of C1–C4 secondary amines and tertiary amines can also be achieved with these columns. We tested different ratios of complexing agents like PDCA and Crown Ether (18,6) to study the effects of separation.

## Conclusion

Affordable and achievable amine and ethanolamines analysis by Ion Chromatography is now available from Metrohm-Peak, Inc. Organic modifiers can be used to speed up the separation. Use of organic modifiers like Acetone or Acetonitrile also sharpens the peak shape of strongly retained amines.

## References

- (1) Metrohm Application Works AW-MP6-0019-042001
- (2) Metrohm Application Works AW MP6-0034-112001
- (3) Metrohm Application Works AWDE8-0595-092005
- (4) Metrohm Application Works AWDE8-0596-092005

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