Introduction

Ion Chromatography is an accurate, sensitive, and simple method for the determination of various cationic amines. The determination of these amines is necessary, due to their commercial applications. For example, ethanolamines are used in the refining industry to scrub carbon dioxide and hydrogen sulfide from stack gasses. It is necessary to monitor these amines in the initial formulation and during the desulfurization process to guarantee maximum efficiency. Amines such as hexamethylenetetramine (hexamine) and ethylenediamine are found in commercial explosives [1]. Ion chromatography can replace hours of wet chemistry methods to analyze these amines and other common cations.

The Alltech Universal Cation Column, which is packed with polybutadiene maleic acid coated silica material, is used for the separation of amines. The separation is based on simple ion-exchange mechanisms. This column is compatible with complexing acid eluants such as citric acid, tartaric acid, phthalic acid, methane sulfonic acid, and mineral acid eluants such as hydrochloric acid and nitric acid. The column is compatible with single-column and suppressor based IC. For more information regarding the Alltech Universal Cation Column refer to Data Sheet #D27100.

Results and Discussion

Separation of ethanolamines on a silica based polybutadiene maleic acid stationary phase (Universal Cation) using single-column ion chromatography is shown in Figure 1. Under these conditions mono, di, and tri-ethanolamine are well resolved. The Universal Cation Column withstands high levels of organic modifiers such as methanol and acetonitrile, which easily elute hydrophobic components from the samples. This allows outstanding versatility in adjusting the selectivity of complex amine separations.

Figure 2 shows the separation of alkylamines on an Universal Cation Column using an eluant containing 3mM methane sulfonic acid / 5% acetonitrile. Organic modifier in the eluant shortens retention times and improves peak shape for amines. Co-elution of peaks could occur if high concentrations of inorganic cations and alkylamines are present in the sample. For shorter retention times, the concentrations of methane sulfonic acid and / or acetonitrile can be increased.

Figure 3 shows the separation of hexamethylenetetramine (hexamine) along with other cations. This method can be applied for the analysis of commercial explosives which are traditionally analyzed by long and tedious wet chemistry methods [1].

Conclusion

Analyses of ethanolamines and alkylamines are simple and accurate using ion chromatography. The Alltech Universal Cation Column, with single-column based IC systems, can be used for analyzing ethanolamines and alkylamines.
Cation Analysis of Oxidizer Salts

1. Ammonium
2. Hexamethylenetetramine
3. Magnesium
4. Calcium

Figure 3

<table>
<thead>
<tr>
<th>Description</th>
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<tbody>
<tr>
<td>Universal Cation</td>
<td>27100</td>
</tr>
<tr>
<td>100 x 4.6mm, 'B' Fittings</td>
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</tr>
<tr>
<td>100 x 4.6mm, 'C' Fittings</td>
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<tr>
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<tr>
<td>100 x 4.6mm, Metal Free</td>
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References

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