The Analytical Challenge

Simultaneous Determination of Stainless Steel Components in Urine Samples using ICP-DRC-MS

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Introduction and Background

This report analyzes methodologies for the determination of chromium (Cr), iron (Fe), and nickel (Ni) in urine samples. A method using ICP-DRC-MS with Dynamic Reaction Cell (DRC) technology, coupled with an ST (Syringe) nebulizer and an SC (Syringe) pump delivery system, was developed to determine levels of Cr, Fe, and Ni in urine samples. The method was validated using matrix spikes of Cr, Fe, and Ni, and recoveries were assessed.

The Analytical Challenge

The main components of urine include salts, urea, and other organic materials, such as those found in hair and hair roots. High levels of metals in urine can indicate occupational exposure to these metals. In the high-temperature sector, instruments can be exposed to certain species of Cr have been well studied. The presence of metals in 1% (v/v) HNO3 and digested with heat to lower internal standard recoveries, and possibly leading to bias in results.

Approach

1. A sample containing water was analyzed via ICP-DRC-MS to determine the recoveries of Cr, Fe, and Ni. The matrix matrix components of urine include salts, urea, and other organic materials.

Methods and Materials

1. Methods included Per-Sample Analysis Time by Method, Per-Sample Analysis Time, Reference Value, and Analysis of Study Samples. The Per-Sample Analysis Time was determined by manual measurement of the sample analysis time for the samples analyzed.

Experimental Instrumentation Settings

<table>
<thead>
<tr>
<th>Setup No.</th>
<th>Sample Introduction Type</th>
<th>Matrix Spike Pairs</th>
<th>Flow Rate (mL/min)</th>
<th>Reference Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ST nebulizer and an SC pump delivery system</td>
<td>10x dilution</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>2</td>
<td>ST nebulizer and an SC pump delivery system</td>
<td>10x dilution</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 1: Experimental Instrumentation Settings

Results and Discussion

Pan-Sample Analysis Time by Method

<table>
<thead>
<tr>
<th>Sample Introduction Type</th>
<th>Flow Rate (mL/min)</th>
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<td>ST nebulizer and an SC pump delivery system</td>
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<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Tables 2: Pan-Sample Analysis Time by Method

Standard Reference Material Results

<table>
<thead>
<tr>
<th>Reference Value</th>
<th>Setup No.</th>
<th>Low Level</th>
<th>High Level</th>
<th>Standard Reference Material Results</th>
</tr>
</thead>
</table>
| 0.5%             | 1         | 100%     | 100%      | Cr, Fe, and Ni recoveries were assessed for the samples analyzed. The results obtained for time analysis were converted across multiple analytes, and data was normalized to the original standards. For the samples analyzed, the data was analyzed for time analysis.

Figure 3: Datas analysis showing standard Cr matrix spike recoveries for these samples. The figures show that the data was analyzed for time analysis. The results obtained for time analysis were converted across multiple analytes, and data was normalized to the original standards. For the samples analyzed, the data was analyzed for time analysis.

Conclusions

The method described above has been validated against standard reference material, and results were compared to the MDL (Method Detection Limit) values. The method was found to be accurate for the samples analyzed, and results were compared to the MDL (Method Detection Limit) values. The method was found to be accurate for the samples analyzed, and results were compared to the MDL (Method Detection Limit) values. The method was found to be accurate for the samples analyzed, and results were compared to the MDL (Method Detection Limit) values. The method was found to be accurate for the samples analyzed, and results were compared to the MDL (Method Detection Limit) values. The method was found to be accurate for the samples analyzed, and results were compared to the MDL (Method Detection Limit) values.

References


Acknowledgements

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