# IC Application Note No. S-116

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| **Title:** | **Determination of borate, chloride and sulfate in one single run applying a step gradient** |


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| ***Summary*:** | Determination of borate and chloride with direct conductivity detection (exhausted MSM). After the introduction of the fresh MSM unit (stepping) and after the eluent change, sulfate is analyzed with conductivity detection after chemical suppression. |


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| ***Sample:*** | Nickel plating bath (synthetic) |
| ***Sample Preparation:*** | Dilution, injection through cation exchanger cartridge or 793 IC Sample Prep Module |

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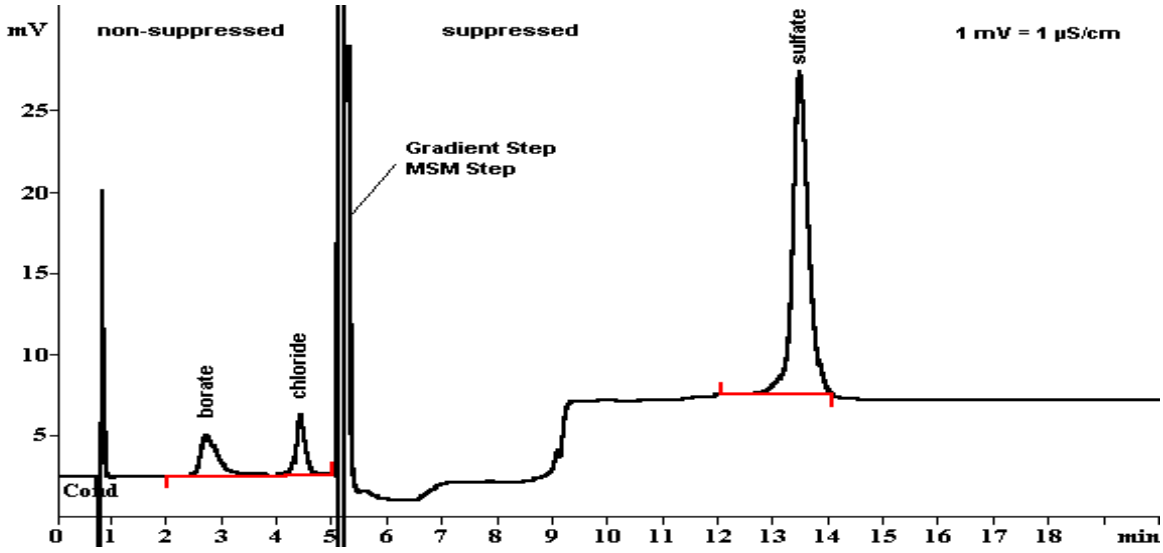
| ***Column:*** | 6.1005.100 Phenomenex StarIon A300 |
| ***Eluent:*** | A: 3.2 mmol/L sodium hydroxide<br>B: 3.2 mmol/L sodium hydroxide,<br>1.0 mmol/L sodium carbonate |
| ***Suppressor:*** | MSM (50 mmol/L $H_2SO_4$) |
| ***Flow:*** | 1.5 mL/min |
| ***Injection Volume:*** | 20 µL |




| ***Results:*** | Borate mg/L | Chloride mg/L | Sulfate mg/L |
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| **injected** | **40** | **20** | **20** |

1 … 5.2 min.: Non-suppressed, eluent A, polarity –. Eluent flows through the exhausted MSM unit.
5.2 min.: Eluent B, suppressor step
5.2 onwards: Polarity +, suppression active. Next injection after breakthrough of the MSM unit (total run time approx. 55 min.)