# Elemental Scientific Inc
# Technical Note- 11

## Online matrix removal and preconcentration SC-Fast series auto samplers

Determination of transition row metals in seawater is complicated by matrix suppression, numerous interferences and naturally occurring low concentrations. The SC-*Fast* system is connected to the Element-XR (HR-ICP-MS) and adapted for online matrix removal and preconcentration (20 fold) of low volume (1.5mL) samples. A multi-element method allows the determination of several trace elements. Here we demonstrate the utility of this rapid method (8 mins/sample) for Fe, arguably one of the most difficult transition row elements in seawater.

### Instrumentation & sample intro
- Element-XR
- SC-E2-Fast
- PFA µFlow ST nebulizer
- Cyclonic spray chamber

### SC-Fast
The SC-2 auto sampler is combined with a 6 port valve, controlled via auto sampler software and easily integrated with any ICP. Substitution of the sample loop for a column containing the IDA functional combined with programmed autosampler movement and valve
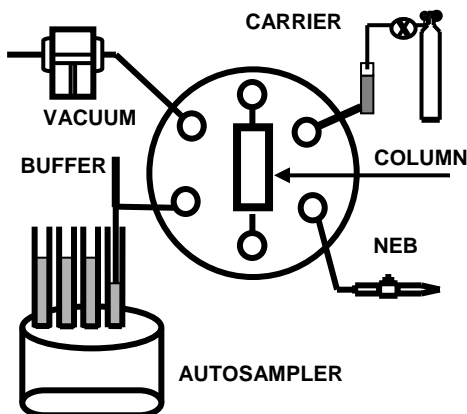


position allows the system to be used for online matrix removal and preconcentration.

### Operating parameters
Samples are vacuum loaded and mixed with buffer before the column (0.5 mL min$^{-1}$), washed with Mili-Q/Buffer solution then pressure eluted (0.1 mL min$^{-1}$) into a cyclonic spray chamber via a PFA-ST nebulizer (see Table). The Element-XR is operated in medium resolution mode to eliminate polyatomic interferences. A sample uptake time of 220s is used and corresponds with column loading and washing. This is followed by 240s

of rapid scanning. The first 120 to captures the eluted signal then the valve is switch and the column conditioned for 120s while carrier is injected to the spraychamber.

| Operation | Time (s) | Valve | Flow Rate |
|---|---|---|---|
| Load column | 180 | Load | 500 uL/min |
| Wash column | 40 | Load | 500 uL/min |
| Elute column | 120 | Inject | 100 uL/min |
| Condition column | 120 | Load | 500 uL/min |

### Elution profiles
The low dead volume column, tubing, valve and ST µFlow nebulizer result in the rapid elution of peaks (60s) at 100µL/min flow rates. The exclusion of a peristaltic pump combined with a PFA flow path provides low
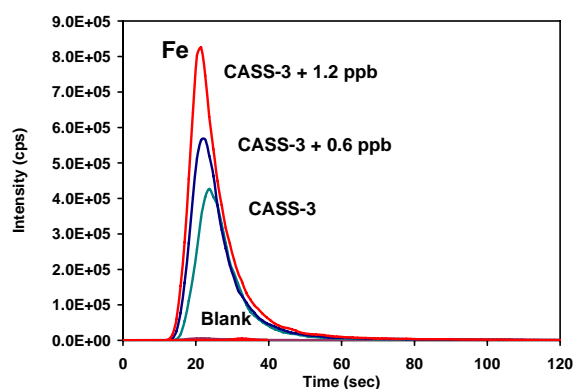


blanks and eliminates pump noise. Smooth elution profiles (3 point moving average) illustrate the high signal to blank ratio and standard additions to CASS-3.

### Calibration
Summing the data for each peak provides a standard addition curve with excellent linearity.
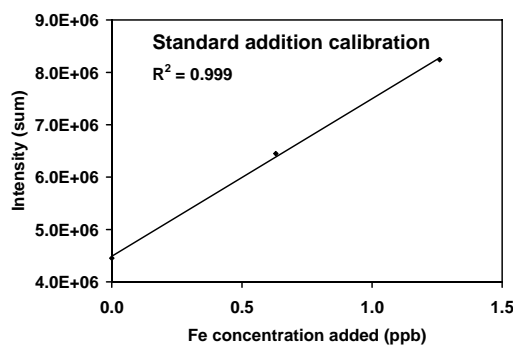


### Precision and Accuracy
Excellent accuracy and precision (<5%) are obtained when one standard addition slope is used in combination with an internal standard (Indium) to calculate Fe in CASS-4.