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# ASAS

## *Automated Standard Addition System*

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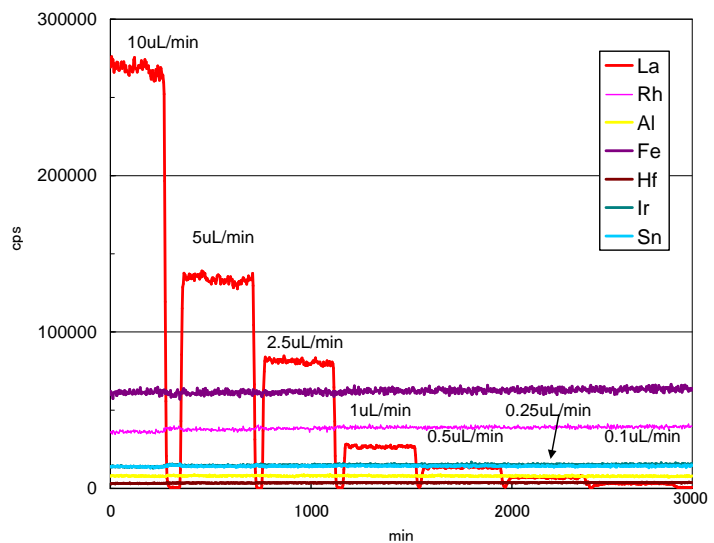
### *ASAS sets an operator free from troublesome preparation of standard solution*

- ◆ Two modes are available:  
**Standard addition (SA) mode** --- calibration standard solution is prepared automatically.  
**Internal standard (IS) mode** --- internal standard solution is added to sample automatically.
- ◆ **High precision syringe pump** (Glass: 2,500 uL or 1,000uL, PEEK: 1,000 uL) and the patented configuration of no valve in the standard addition line allows addition of standard solution into sample line at uL/min automatically. A typical output flow is around 1 uL/min.
- ◆ **Metal free** fluoropolymers and PEEK are used for all wetted surface. (All solution used doesn't touch glass syringe)
- ◆ **Optical flow sensors** that don't contact a sample solution measure the sample uptake rate.

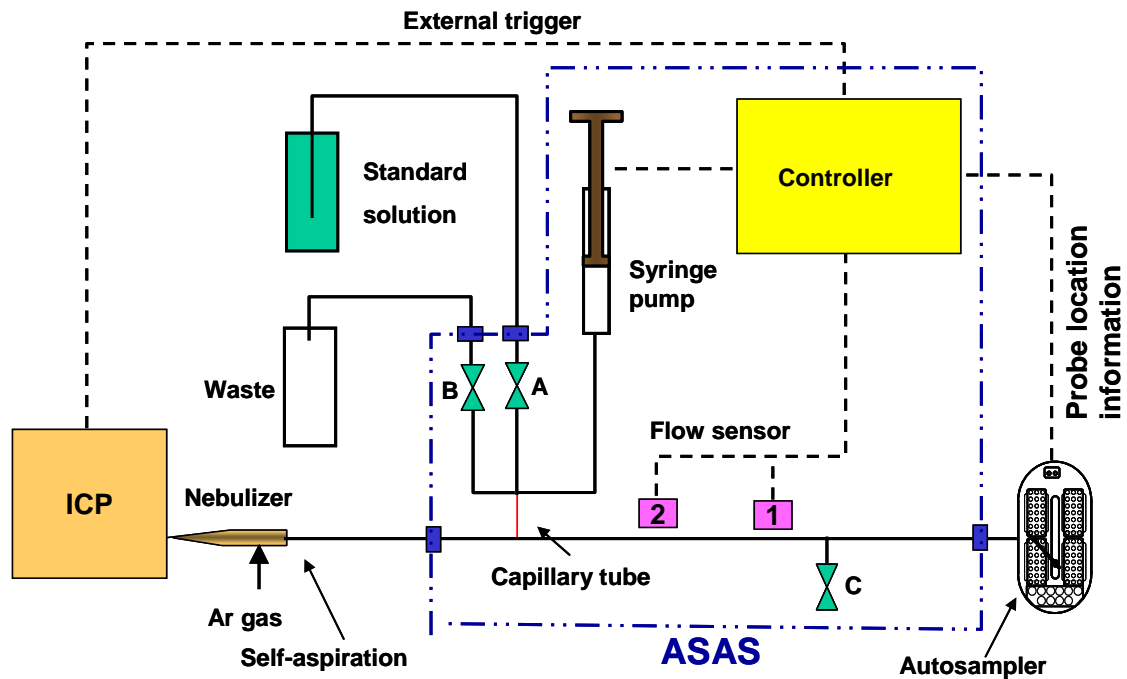


**Patented**

- ◆ **Touch panel** operation (IS mode) or **PC controlled** operation (SA mode) is available.
- ◆ **Auto refilling** of standard solution when solution in the syringe becomes the empty level.
- ◆ **Synchronization** with ICP and autosampler is available.



A 1 ppm La solution was added from 10 uL/min to 0.1 uL/min to a 1 ppb Rh, Al, Fe, Hf, Ir, Sn sample solution

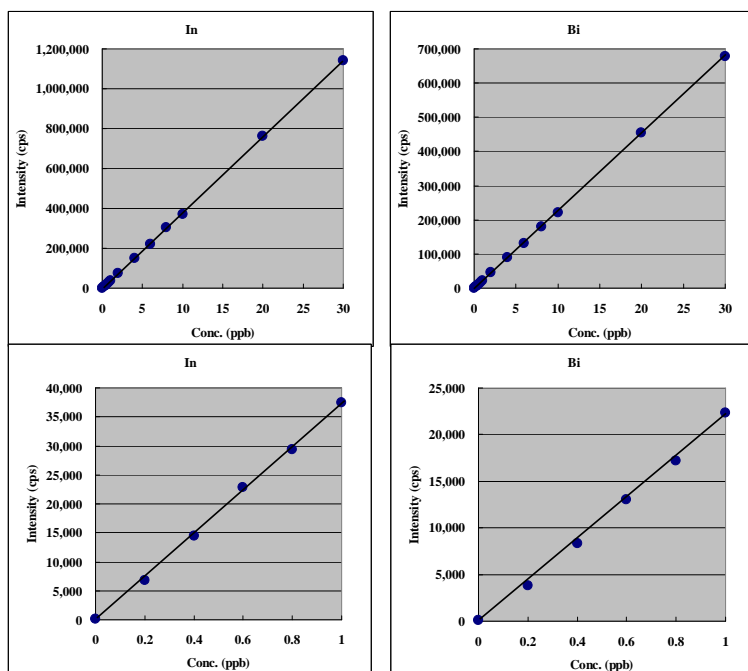
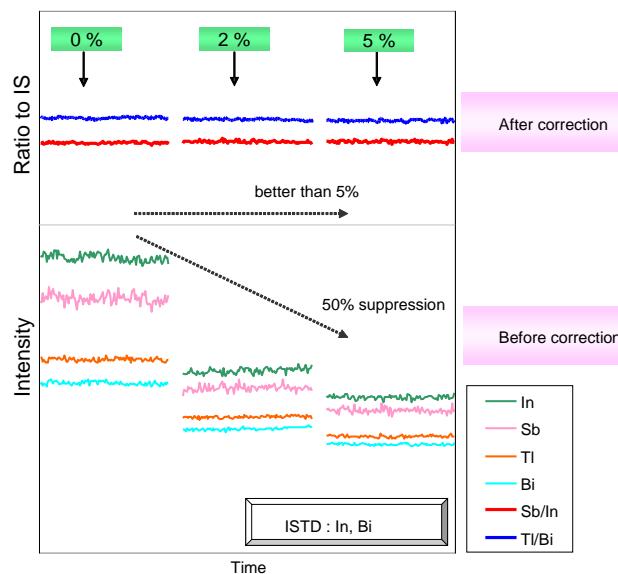


### [ Principle of ASAS ]

- Sample solution is aspirated by a nebulizer or peristaltic pump.
- When an autosampler probe moves to one of vials, it initiates the measurement of sample uptake rate by the flow sensor.
- An air bubble is introduced from valve C, and the optical fiber sensors 1 and 2 measure a time of passing air bubble, by which the sample uptake rate is automatically calculated.
- Syringe pump pushes out the standard solution into the sample line at a specified ratio, and the mixed solution is introduced into the ICP.
- After waiting for a stabilization time, the ASAS generates an external trigger signal that initiates data acquisition of ICP.
- When the ASAS is used for the addition of internal standard, it adds the constant ratio of standard solution to the sample flow.
- When the ASAS is used for the method of standard addition, it adds the standard solution to the sample flow to make the specified concentration of calibration.
- When the remaining solution in the syringe becomes the specified volume, the external trigger becomes off after completing the current sample analysis, and the refill is performed automatically. After completing the refill, the syringe pump pushes out at relatively higher flow rate for the specified time, then the flow rate becomes the specified flow and the external trigger becomes on again automatically.
- The Valve A opens when the standard solution is aspirated into the syringe pump. Since the tube used for aspirating standard solution is much larger than the capillary tube used to add the standard solution into the sample line that is under negative pressure, the sample solution is not aspirated into the syringe. This non-valve configuration minimizes the dead volume and allows addition of sub- $\mu\text{L}/\text{min}$  level of standard solution.

A 1 ppb Sb and Tl in 0, 2 and 5 % H<sub>2</sub>SO<sub>4</sub> solutions were introduced into an ICP-MS with a self-aspirated PFA-50 nebulizer. A 1 ppm In and Bi standard solution was added by the ASAS as internal standard. The figure shows the transient signals of those elements.

Because of the viscosity of H<sub>2</sub>SO<sub>4</sub>, the intensity dropped as the concentration becomes higher (“Before correction”). Since the ASAS automatically measured the sample uptake rate and added the constant ratio of internal standard into the sample solutions, the internal standard could compensate the suppression of intensity perfectly (“After correction”).



The ASAS was used for making the calibration curves of ICP-MS. A 700 uL/min self-aspirated concentric nebulizer aspirated a 1% HNO<sub>3</sub> solution and a 1 ppm In and Bi standard solution was added by the ASAS. The concentration levels were from 0.2 ppb to 30 ppb. It showed excellent linear calibration curves.

## Specifications

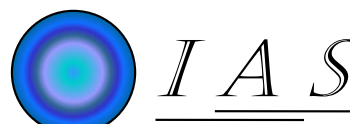
Flow range : 0.5 - 99.99 uL/min (Glass)  
 : 3.0 – 99.99 uL/min (PEEK)  
 Flow sensor : Optical fiber sensor  
 Syringe volume : Glass 1,000 uL (Standard)  
 : Glass 2,500 uL (Option)  
 : PEEK 1,000 uL (Option)  
 Mode : Auto (with autosampler)  
 : Manual (with touch panel)  
 Safety : CE marked

## Environment & utilities

Room temperature : 15 - 30°C  
 Humidity : 35-85%RH, no condensation  
 Power : 100~240 VAC ±10%, 2 A, Single phase, 50/60 Hz  
 Size : 165 (W) x 250 (D) x 395 (H) mm  
 Weight : 6 kg

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