Quantitative measurement of unsteady gas flow rate

Towards the sophisticated measurements of exhaust gas and medical application

It is very difficult to estimate the dynamic response of gas flowmeters quantitatively, since the variation of the pressure in an unsteady gas flow is accompanied by the variation of temperature that is quite difficult to measure quantitatively. The isothermal chamber proposed by Tokyo Institute of Technology has a potential to realize a quantitative unsteady gas flow generator because of its ability to keep the gas temperature almost constant during the variation of pressure. AIST is conducting an applied research work to establish an unsteady gas flow generator based on the isothermal chamber. The uncertainty of the instantaneous flow rate in unsteady flows is improved to 5 % by utilizing critical nozzles to define the inlet flow rate into the chamber. The generator shown in the picture can generate arbitrary waveforms by controlling the pressure in the chamber with the maximum instantaneous flow rate of 0.5 g/s at the atmospheric pressure. The flow rate of the generated flow measured by a high-speed laminar flowmeter coincides very well with the control signal fed into the generator.

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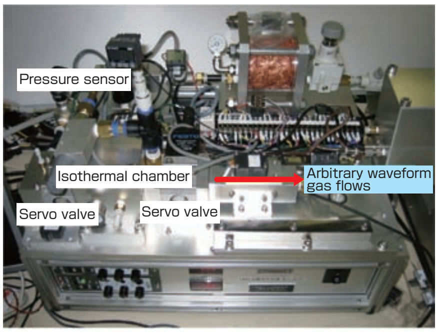

Unsteady gas flow generator

Development of high performance concentric nebulizer for plasma spectrometry

Semi-demountable triple tube concentric nebulizer

A nebulizer is one of the most important components in plasma spectrometers such as ICP-OES and ICP-MS. Nowadays, application of ICP-OES and ICP-MS to the analysis of low volume samples and/or samples with high salt-concentration has rapidly grown especially in semiconductor, clinical, biological, and environmental research fields. We developed a high performance concentric nebulizer (HPCN) for ICP-OES and ICP-MS. HPCN has a semi-demountable triple tube concentric structure. HPCN shows an excellent performance for the following three points; highly efficient aerosol generation, high tolerance for total dissolved solids (TDS), easy designing for various flow rates of solutions. In the nebulization by HPCN, a microthread liquid flow is formed inside the nebulizer nozzle by a flow focusing effect. This phenomenon gives both the efficient aerosol generation and the high TDS tolerance. Now, we have applied HPCN to various research fields such as material, clinical, biological, and nuclear fuel analysis.

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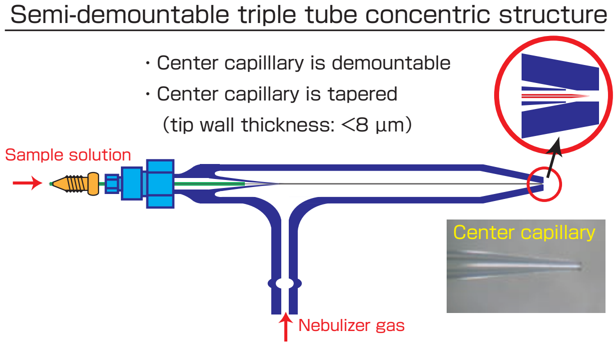

Schematic diagram of HPCN