A Fully Ceramic Torch and other Accessories for Maintaining QC in the ICP Laboratory

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Glass Expansion D-Torch

The D-Torch is a revolutionary new demountable torch design. It provides the benefits of a fully demountable torch at a significantly lower cost. The D-Torch is available for a range of ICP models, including those from PerkinElmer, Spectro, Thermo, and Agilent (Varian). Our newest D-Torch release is for the Agilent 7700 and 7700 ICP-MS, and we will soon be releasing a D-Torch for other ICP models.

Options Suited To Your Application Needs

D-Torch products shown below are for the Thermo ICP 6800 series Radical ICP

The ICP torch is a relatively high cost consumable item that requires regular maintenance and replacement when performing more demanding applications, e.g., hydrofluoric acid (HF), organics, and hard and dissolved solids. The D-Torch has an interchangeable outer tube so that you can replace the outer tube when it fails rather than replacing the entire torch. Outer tubes made of quartz or ceramic are available (ceramic not available for all models). The ceramic outer tube is of particular benefit for the analysis of wear metals in engine oils, where quartz outer tubes often suffer from short lifetime. It is also beneficial for Si determinations, where quartz outer tubes can produce significant background signals. In general, the ceramic outer tube has a much longer lifetime, greatly reducing interruptions and downtime due to torch failure. The D-Torch also features a unique intermediate tube and an interchangeable injector. This allows the analyst to have a specific injector for each application whether aqueous, organics, high dissolved solids or HF. Injectors made from high quality stainless steel are available in a variety of internal diameters to suit your application needs.

The outer tube of the ceramic D-Torch is made from silicon nitride. A combination of high temperature and salt deposit causes a quartz torch to devitrify. Higher concentrations of salt in the sample lead to more rapid devitrification. The quartz torch in the photo (above left) was run for only 5 hours with samples containing 10% NaCl and it is already badly degraded. By contrast, the ceramic outer tube of the D-Torch does not devitrify and is not affected by salt deposits. The ceramic D-Torch in the photo (above left) was run for the same period and with the same samples as the quartz torch but showed no degradation at all.

Improved Plasma Robustness with a Ceramic Torch

Typical ICP operating conditions require Argon flow rates of 15.0 L/min; this high flow is necessary to shield the quartz material of the torch assembly. However, the high flow rate also cools the plasma. Running at a high flow rate can result in a more robust plasma, but there is a danger of damaging the quartz torch. A ceramic torch has a heat resistance above 3000°C compared to quartz, which can begin to melt at 1200°C. With a ceramic D-Torch in place of the standard quartz torch, Argon flow rates can be reduced down to 10 L/min or lower. The ICP figures of merit obtained on a Perkin Elmer Optima 3100 DV are compared at a plasma gas flow rate of 15.0 L/min and 10.0 L/min. Using a ceramic D-Torch, plasma robustness, ablation pressures, excitation and stability were greatly improved.

Maintaining QC in the ICP Laboratory

The stability of results for ICP spectroscopy depends upon a number of parameters, two important factors that we will address are the importance of maintaining constant spray chamber temperature and total base sample uptake rate.

Isofluent Programmable Temperature Spray Chamber

The Isofluent Programmable Temperature Spray Chamber provides the benefits of a temperature-controlled ICP spray chamber at a significantly lower cost. The Isofluent maintains temperatures from -40°C to +200°C (the standard model) or to +400°C (the Isofluent high temperature model) with rates of up to 40°C per hour. Isofluent features include a sapphire window, a ceramic sleeve for sample introduction, an electronically controlled heating element, and computer control of temperature and rate. The Isofluent Programmable Temperature Spray Chamber translates the benefits of ICP-AES/MS and the Isofluent spray chamber into a cost-effective ICP-MS solution.

When the best temperature flexibility or temperature stability is required, we recommend the Isofluent Programmable Temperature Spray Chamber. However, for many ICP-MS applications, a fixed temperature of around 2°C is used and no flexibility is needed. For these applications, we recommend the Peltier Cooled Cyclonic (PCC) Spray Chambers for the Agilent 7700 and 7700 ICP-MS models. These accessories are based on the spray chamber and Peltier system of the tandem but are coupled to the electronics and water cooling of the ICP-MS. Agilent 7700 and 7700A users can therefore reap the benefits of a cyclonic spray chamber under control of the instrument software. Comparing the stand spray chamber, the PCC spray chamber provides faster cooldown, increased sample throughput, and improved precision and sensitivity. The GE PCC also provides the analyst with a selection of different spray chamber designs to best suit their application needs.

Peltier Cooled Cyclonic Spray Chamber Agilent ICP-MS

- Interchangeable glass, quartz, and PFA cyclonic spray chambers
- Constant sample introduction flow rate is never available
- Supplied with convenient mounting bracket
- Temperature controlled by Agilent ICP-MS software and electronics
- Peltier cooling system

Utilizes standard water cooling from Agilent ICP-MS, quick-connect water lines

Analytical Performance of the GE PCC

Effect of spray Chamber Design on Precision

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The essential Agilent lambda model was redeveloped and optimized for use in the PCC. Loading a spray chamber on the PCC will increase the performance of the ICP-MS by 20% relative to the standard spray chamber. Therefore, shipping spray chambers packed in a temperature-controlled environment will ensure that the performance of the spray chambers will not be compromised. The PCC system also offers a number of other benefits, including increased sample throughput and a reduction of the need for spray chamber cleaning. The PCC system is also available as a stand-alone module.