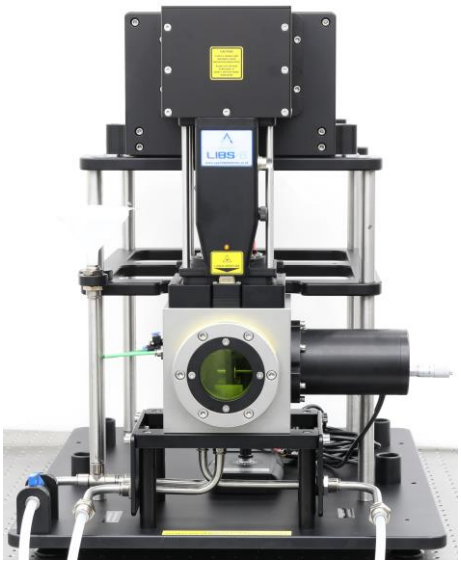
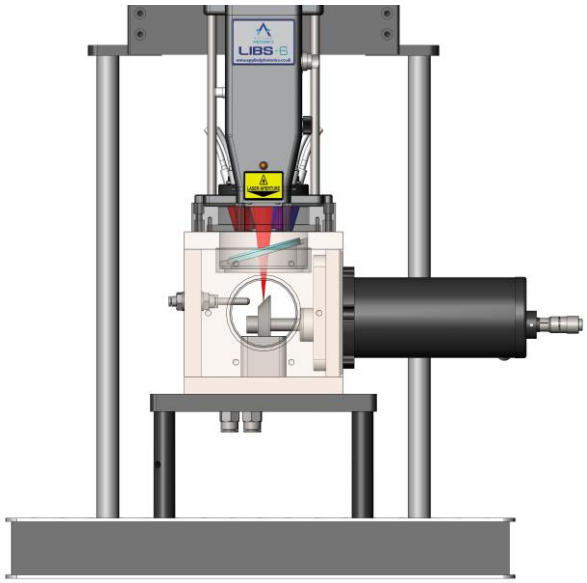
APPLIED PHOTONICS
LASER SPECTROSCOPY SOLUTIONS

SC-LQ2
Modular LIBS Sample Chamber

Liquids analysis modular sample chamber





LIBS-6 module with laser head and adaptor platform using one of our modular SC-LQ2 sample chambers.

Basic principle of operation

Direct analysis of bulk liquids by LIBS can be problematic in that the action of the focussed laser beam causes considerable disturbance to the liquid surface which can result in undesirable effects such as splashing. In addition to droplets of the liquid forming on internal components including lenses, windows etc, the distance between the focal plane of the laser beam and the liquid surface changes as the liquid is disturbed making it difficult to maintain correct focus of the laser beam to ensure consistent plasma formation. With the SC-LQ2 liquids sample chamber, the liquid is presented to the laser beam as a thin film on a corrosion-resistant metallic surface in such a way that the volume of liquid at the focal plane of the laser beam is continually replenished. The general design of the liquids sample chamber is illustrated in the diagram above. A rotating nickel-plated stainless steel wheel is wetted by the liquid by submerging the lower section of the wheel in the liquid which is contained in a small reservoir located at the bottom of the sample chamber. A gas purge jet (preferably air or argon but other inert gases may be used) is directed at the surface of the wheel to reduce the thickness of the surface film of liquid. As the wheel rotates (typically a few revolutions per minute and user adjustable), the liquid film spreads evenly and thinly over the surface of the wheel. The laser beam is then brought to focus on the upper side of the wheel, with the focal plane being user adjustable. By adjusting the laser focus, the laser pulse energy, the rotational speed of the wheel and the flow of purge gas, it is possible to obtain stable and consistent plasma formation without splashing of the liquid. Furthermore, optimisation of the measurement conditions results in virtually zero contribution to the LIBS signal from the nickel-plated rotating wheel. We have experimented with various materials for the rotating wheel including polymers, carbon, and metal alloys but nickel-plated 316 stainless steel appears to offer the best overall performance, at least for the liquid samples used in our experiments. All components used in the liquids sample chamber are corrosion-resistant allowing the analysis of acidic or caustic solutions to be performed.

Features

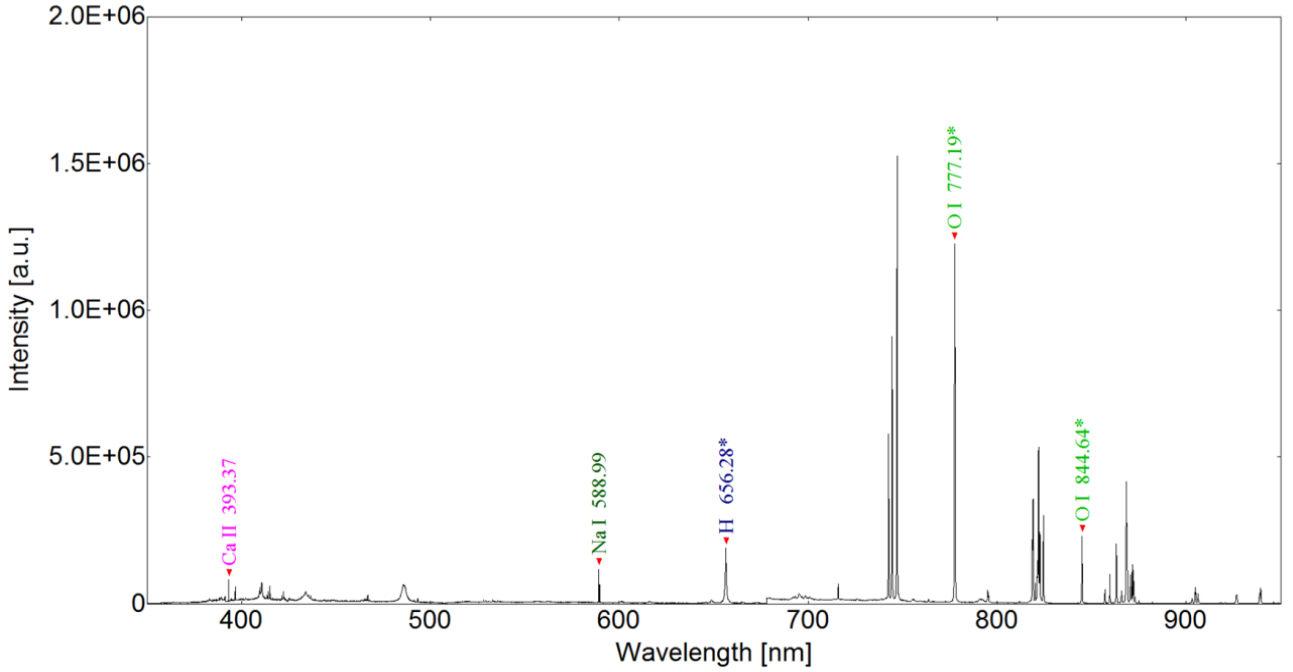
- Modular sample chamber compatible with our LIBS products (LIBSCAN range, LIBS-6, LIBS-8)
- Static liquid reservoir or flow-through operation
- Reservoir capacity of approximately 100 ml, flow through capacity of typically 25 - 50 ml / per minute
- Precision-engineered using corrosion resistant materials
- Micrometer control of position of liquid surface film relative to focal plane of laser beam
- Viewing port equipped with laser protective window (OD 6+ @ 1064 nm)
- External dimensions of approx. 285 mm x 385 mm x 180 mm.

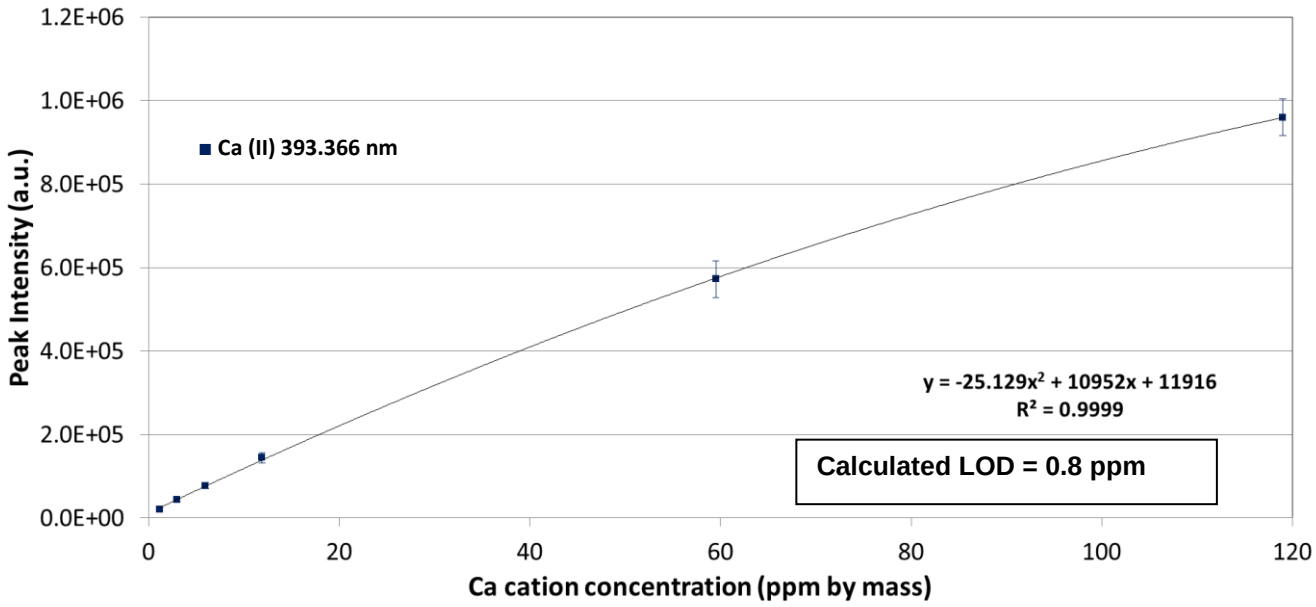
Example experiment:

A calibration plot for calcium using prepared solutions of artificial sea water

The following spectra & calibration curve were obtained using prepared solutions of artificial seawater (Tropic Marin)

500 ppm Tropic Marin (5.95 ppm Ca) in distilled water (50 accumulation shot LIBS spectrum, purge gas: N_2)





Sample #	Tropic Marin (ppm)	Ca (ppm)	Mean Peak Intensity (a.u)	SD (a.u.)	RSD (%)
1	100	1.19	20663	3109	15.1
2	250	2.98	42924	4510	10.5
3	500	5.95	77465	7750	10.0
4	1000	11.9	144645	12592	8.71
5	5000	59.5	572522	44096	7.70
6	10000	119	959830	44431	4.63

Specifications subject to change without notice

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