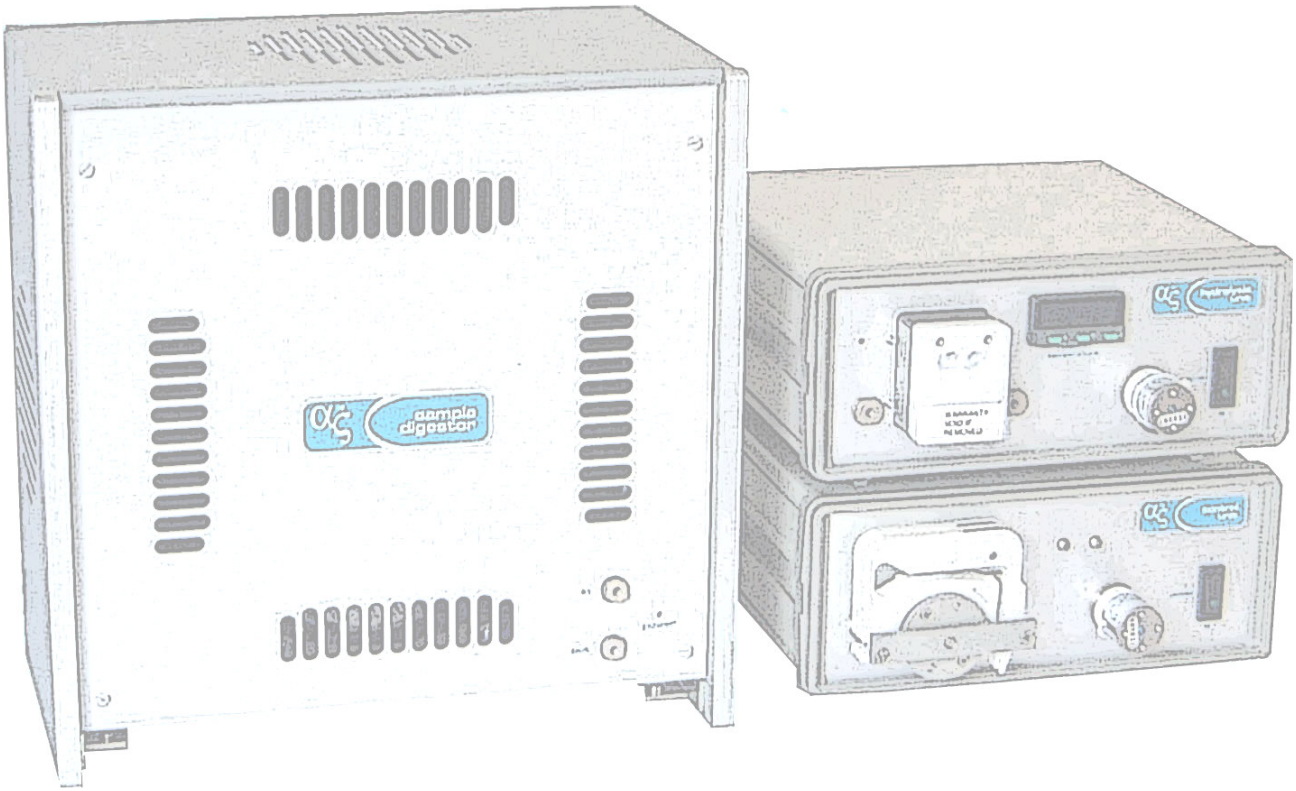
Radox™

a new concept in sample preparation…

Sample Digestion

Elemental Analysis

Sample Preparation



Total Digestion

Total Recovery

analytical sciences

A powerful "cold" digestion method which works without hazardous reagents; designed in the first instance to automate the measurement of Total (and Organic) Phosphorous but with the ability also to measure a wide range of other elements in aqueous matrices… simultaneously

Total Phosphorous Sulfur Flouride Chloride Halides Calcium Sodium K Mg

Elemental analysis

Liquid samples, in particular water matrix samples, generally require a raw sample to be digested before measurement.

This presents the element of interest in a homogenous form and allows the use of simpler inorganic chemistry analysis techniques .It follows, therefore, that an effective digestion technique is key to the analysis of many elements.

Sample Preparation

Many assay techniques are greatly improved if the organic component of the sample is decomposed prior to analysis.

Digestion Techniques

Many techniques have been used for digesting organic materials, all of which have their drawbacks.

Acid digestion is time consuming and uses a variety of different and hazardous reagents and chemicals, all of which can add contamination to the sample.

Microwave digestion is basically an accelerated acid or Persulfate digestion, so has some of the corresponding drawbacks as well as sometimes being explosive.

UV digestion techniques suffer from recovery problems, especially with samples that are cloudy or contain suspended material. To work large quantities of powerful and hazardous oxidizing agents must be added.

How does it work?

Up to 2 kilowatts of UV and IR Radiation focused on < 250 microns of sample depth

The Radox

It works by using intense electromagnetic radiation across a very broad spectrum including both UV and infrared. Conventional UV digestion equipment tends to use low-pressure UV lamps (usually operating at less than 40 watts) producing ultraviolet radiation mainly in the region of 253.7nM.

It has been found with the Radox that by exposing the sample to a broader higher intensity radiation, a sample can be digested far more efficiently and quickly than by conventional UV methods.

Irradiation source

The radiation source used for the Radox emits a broad spectrum from the ozone-producing region (<185nM) to the infrared (<1000nM). In addition to producing ozone, hydroxyl ions and other free radicals, the radiation, is sufficient to excite and break many of the molecular bonds present in organic material.

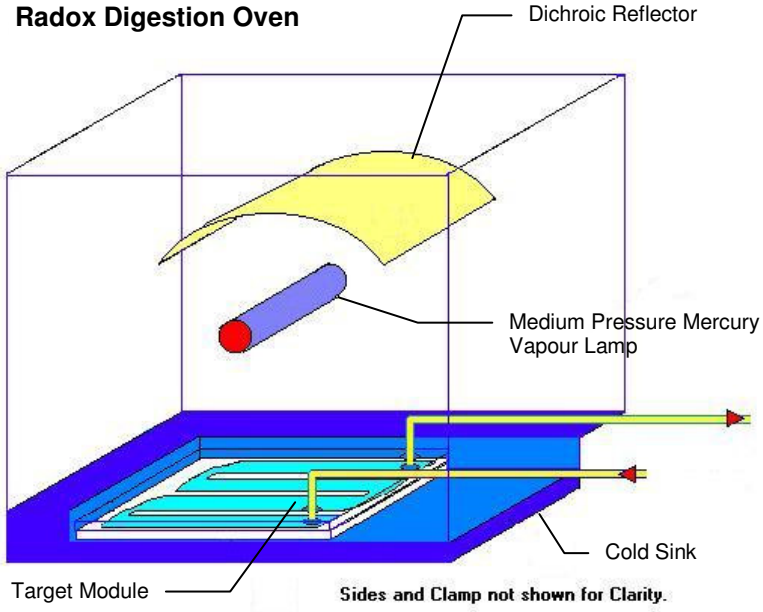
A combination of the greater energy employed and the novel sample exposure system also allows the Radox to cope with semi-opaque and turbid samples.

Oven Construction

The oven housing and exposure unit is constructed from special heat-sink components, surrounded by high efficiency low-noise cooling fans. The oven is sealed to ensure there is no dangerous UV light or Ozone leakage produced by the mercury vapour lamp.

The sample is pumped through a heat-controlled serpentine track formed into a quartz plate. The depth of the track is 250µm; this leads to a more efficient oxidation and the ability to oxidize semi-opaque samples with which conventional UV systems struggle.

Radox Digestion Oven



The Radox may be configured for continuous or batched digestion of aqueous matrix samples.

Digested sample flows out of the Radox free from bubbles at flow rates up to 3.0ml/min.

Ion Chromatography and Voltammetry

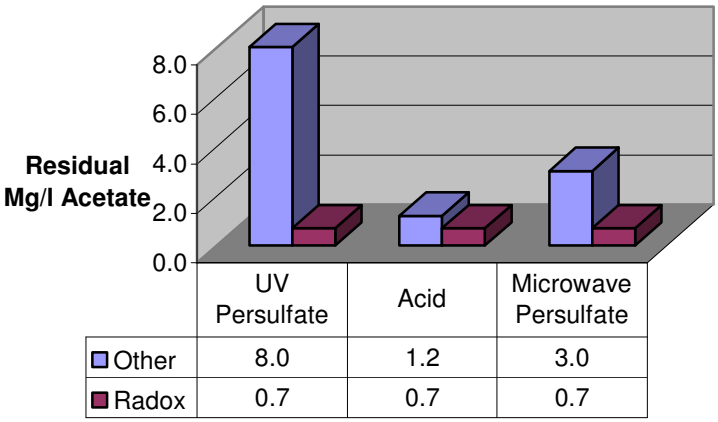
Both IC and VA are ideal analytical techniques to use with the Radox. On many applications the only reagent required is hydrogen peroxide (< 0.1%), so the contamination, especially from strong acids, metal ions and other reagents used by conventional digestion techniques are avoided, allowing, for the first time, online use of both IC and VA with this powerful digestion technique..

Ultrapure Water

Using an IC with the Radox opens up a new realm of possibilities for elemental analysis at very low levels. Because only small amounts of H2O2 are added, the measurement of Total Phosphorus, Total Sulfur and the Halides is now possible at the PPT level.

And because the sample is kept cool, no precipitation or scaling takes place.

Comparitive Digestions 200mg/l of Acetic Acid



	UV Persulfate	Acid	Microwave Persulfate
Other	8.0	1.2	3.0
Radox	0.7	0.7	0.7

Comparisons were made by measuring residual Acetate after digestion at flow rates of 1.0 ml/min

Sample Flowrate	Programmable, typically 1.0ml/min. Rinsing @ 6ml/min
Sample Volume	<1.8ml
Wetted Parts	Quartz, PEEK. O-rings in Perlast™ Flouroelastomer
DI Water required to rinse target of 1%HCl to < 10PPB HCl	3 minutes @ 6.0ml/min
Inlet/Outlet connections	10-32 Ports
Degassing	By membrane degassing
Dimensions	575x430x480 DWH
Weight	25 kg
Power Requirements	110/220/240 Vac 50/60Hz; 2500VA
Other services	Degasser requires compressed air @2.0Barg
Ambient constraints	3 to 24 Celsius (Some applications require <21Celcius)
Protection Class	IP45

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