

cables in the first and second sets consist of non-solarizing UV grade optical fibers, which are appropriate for instruments that may operate with light wavelength ranges that are referred as “deep UV,” such as, for example, down to 193 nm. For instruments operating in other wavelength ranges, the same or other optical fibers may be used. ~~and operate in a known manner.~~

The detector 160, which receives the light guided to it by the fiber optic cables 110 and 111, may be a monochromator that, as needed, utilizes slits or other mechanisms (not shown) to direct the light provided by the fiber optic cables to different regions of a single sensor. Alternatively, the detector may include two sensors (not shown) that are positioned appropriately to receive light directly from corresponding cables. The detector 160 operates in a known manner to produce signals that correspond to the intensities of the impinging light of selected wavelengths, and provides the signals to a processing subsystem 194.

A system controller 180 controls the operations of the components of the respective modules 102, 104 and 106 and the processing sub-system 194 based on a selection of an atomizer, as discussed in more detail below. The system controller is configured to receive signals from an input device 190, such as a computer keyboard or touch screen, through which a user provides atomizer selection instructions and, as appropriate, other instructions for the analysis. A display device 192 provides information to the user relating to system operation, as well as the results of the processing performed by the processing sub-system 194.

The atomizers 140 and 150 may be, for example, a flame chamber, or nebulizer, and a furnace, such as, for example, a graphite tube. A user enters instructions through the input device 190, to select which of the atomizers to use for sample measurement at a given time. In response to the instructions, the system controller 180 controls operation of the light sources 120 and 122 and the atomizers 140 and 150, to provide optical measurement, background correction and reference information to the detector 160.

More specifically, the system controller 180 operates the selected atomizer 140, 150 in a known manner to provide the light from which sample measurements and background correction information is obtained and operates the non-selected atomizer in a mode that allows light to simply pass through, to provide reference information. The system controller further controls the operation of the processing sub-system 194, such that the sub-system processes the signals associated with the selected atomizer as measurement path signals and the signals associated with the non-selected atomizer as

CLAIMS

1. A photonic measurement system including
one or more light sources;
at least two analysis chambers, wherein one or more of the analysis chambers
contains a sample to be analyzed;
a first set of fiber optic cables that guide light produced by the one or more light
sources to each of the analysis chambers;
a second set of fiber optic cables that guide light from the respective analysis
chambers to a detector;
the detector configured to produce signals corresponding to intensities of light
guided to the detector from respective cables of the second set of fiber optic cables;
a processing sub-system that processes signals provided by the detector; and
a system controller that controls the one or more light sources and the analysis
chambers to operate a selected analysis chamber to perform a sample analysis and
controls the processing sub-system to process the signals associated with the selected
analysis chamber as measurement signals.
2. The photonic measurement system of claim 1 wherein
the light sources are of first and second types, and
the first set of fiber optic cables includes a selector/mapper that bundles and maps
optical fibers to guide light from each of the first and second types of light sources to
respective analysis chambers.

3. The photonic measurement system of claim 2 wherein the processing sub-system processes signals associated with a non-selected analysis chamber as reference signals.
4. The photonic measurement system of claim 3 wherein the system is an atomic absorption spectrometer and the analysis chambers are a furnace atomizer and a flame atomizer.

~~12.~~ 5. The photonic measurement system of claim 4 wherein the first and second light sources are hollow cathode lamps and ~~Deuterium~~ Deuterium lamps.

~~13.~~ 6. The photonic measurement system of claim 4 wherein the first and second light sources are electrodeless discharge lamps and ~~Deuterium~~ Deuterium lamps.

~~15.~~ 7. The photonic measurement system of claim 4 further including a switching mechanism that provides light from the first source type to a first selected analysis chamber and light from both first and second source types to a different selected analysis chamber.

~~7.~~ 8. The photonic measurement system of claim 2 further including
a third fiber optic cable that provides light from the first and second types of light sources to the detector; and
the processing sub-system processes signals associated with the third fiber optic cable as reference signals.

~~5.~~ 9. The photonic measurement system of claim 1 further including
a first plurality of couplers to couple light to and from the fiber optic cables in the first set, and
a second plurality of couplers to couple light to the fiber optic cables in the second set.

~~6.~~ 10. The photonic measurement system of claim ~~5~~ 9 wherein the first and second couplers are off-axis ellipsoid mirrors.

~~9.~~ 11 The photonic measurement system of claim ~~5~~ 9 further including
multiple light sources of the first type that produce light in respective
wavelengths, and
means for positioning the corresponding coupler relative to a given one of the
light sources of the first type to couple light of a selected wavelength to the first set of
fiber optic cables.

~~10.~~ 12 The photonic measurement system of claim ~~5~~ 9 further including
multiple light sources of the first type that produce light in respective wavelengths
for absorption, and means for positioning the light sources with respect to the
corresponding coupler to couple light from a selected light source of the first type to the
first set of fiber optic cables.

~~11.~~ 13 The photonic measurement system of claim ~~5~~ 9 further including
multiple light sources of the first type that produce light in respective wavelengths
for absorption, and
multiple couplers that couple light from the respective multiple light sources to
the first set of fiber optic cables.

~~8.~~ 14 The photonic measurement system of claim 1 wherein the system is an atomic
absorption spectrometer and all of the analysis chambers are furnaces.

14. 15. The photonic measurement system of claim 1 wherein the system performs one of inductively coupled plasma optical emission spectroscopy, ~~ptical~~ optical detection in liquid chromatography, UltraViolet/visible spectroscopy and UltraViolet/visible near infrared spectroscopy.

16. The photonic measurement system of claim 1 wherein one or both of the first and second sets of fiber optic cables consist of non-solarizing UV grade optical fibers.

~~16.~~ 17. A method of operating an atomic absorption spectrometer comprising
selecting an atomizer from at least two atomizers that are configured within
respective guided light paths from light sources to a detector; and
operating a processing sub-system that is configured to receive signals from the
detector to process signals associated with the selected atomizer as measurement signals.

~~17.~~ 18. The method of claim ~~16~~ 17 further including operating the processing sub-system
to process signals associated with a given non-selected atomizer as reference signals.

~~18.~~ 19. The method of claim ~~16~~ 18 further including
making a new atomizer selection; and
operating the processing sub-system to processing signals associated with the
newly selected atomizer as measurement signals and signals associated with a given non-
selected atomizer as reference signals.

~~19.~~ 20. A photonic measurement system including
a source module including one or more light sources;
a sample module including at least two analysis chambers, wherein one or more
of the analysis chambers contains a sample to be analyzed;
a detection module including a detector that produces signals associated with each
of the analysis chambers;
a first set of fiber optic cables that guide light from the one or more light sources
to each of the analysis chambers;

a second set of fiber optic cables that guide light from each of the analysis chambers to the detector;

a processing sub-system that processes the signals produced by the detector; and

a system controller that controls the one or more light sources and the analysis chambers to operate a selected analysis chamber to perform a sample analysis and controls the processing sub-system to process the signals associated with the selected analysis chamber as measurement signals.

~~20.~~ 21. The photonic measurement system of claim ~~19~~ 20 wherein the light sources are different types of light sources, and

the first set of fiber optical cables includes optical fibers that guide light from each of the different types of light sources and a mapper/selector that bundles and maps the optical fibers to guide light from each of the two types of light sources to each of the analysis chambers.

~~21.~~ 22. The photonic measurement system of claim ~~20~~ 21 wherein the system controller further operates the detection module to process as reference signals the signals associated with a given analysis chamber that is not selected.

~~22.~~ 23. The photonic measurement system of claim ~~21~~ 22 wherein the system is an atomic absorption spectrometer and the analysis chambers are a furnace atomizer and a flame atomizer.

24. The photonic measurement system of claim 23 wherein one or both of the first and second sets of fiber optic cables consist of non-solarizing UV grade optical fibers.

25. An atomic absorption spectrometer including
one or more light sources, wherein the light sources are of first and second types;
at least two analysis chambers, wherein at least one of the analysis chambers is a furnace
atomizer and at least one of the analysis chambers is a flame atomizer;
a first set of fiber optic cables that guide light produced by the one or more light sources
to each of the analysis chambers, wherein the first set of optic cables includes a selector/mapper
that maps optical fibers to guide light from each of the first and second types of light sources to
respective analysis chambers;
a second set of fiber optic cables that guide light from the respective analysis chambers to
a detector;
the detector configured to produce signals corresponding to intensities of light guided to
the detector from respective cables of the second set of fiber optic cables;
a processing sub-system that processes signals provided by the detector, wherein the
signals associated with a non-selected analysis chamber are processed as reference signals; and
a system controller that controls the one or more light sources and the analysis chambers
to operate a selected analysis chamber to perform a sample analysis and controls the processing
sub-system to process the signals associated with the selected analysis chamber as measurement
signals.

26. An atomic absorption spectrometer including
one or more light sources;
at least two analysis chambers, wherein all of the analysis chambers are furnaces;
a first set of fiber optic cables that guide light produced by the one or more light sources
to each of the analysis chambers;
a second set of fiber optic cables that guide light from the respective analysis chambers to
a detector;
the detector configured to produce signals corresponding to intensities of light guided to
the detector from respective cables of the second set of fiber optic cables;
a processing sub-system that processes signals provided by the detector; and
a system controller that controls the one or more light sources and the analysis chambers
to operate a selected analysis chamber to perform a sample analysis and controls the processing
sub-system to process the signals associated with the selected analysis chamber as measurement
signals.