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Spectrophotometer



Atomic absorption spectrophotometers are invaluable instruments for identifying and measuring trace amounts of metals in substances. For this reason, they are used in such areas as air pollution studies, plant nutrient research, mineralogy and clinical chemistry.

The principle behind the instruments is simple in theory. A sample to be analyzed is dissolved in a solution and sprayed into a flame to dissociate the sample into atoms. Then a light source is beamed in and, depending on the wavelength used, the individual atoms of a particular metal selectively will absorb the light. The wavelength absorbed by that particular metal is specific for it and therefore identifies it. The amount of light absorbed is proportional to the metal's concentration, and therefore determines quantity.

A drawback with the instruments in actual practice, though, is that when samples which have a high metals content or a hydrocarbon matrix with metal impurities are analyzed errors are introduced. For example, light can be lost through scattering or molecular absorption, and, if compensation is not made, errors occur.

A new instrument provides a means for automatically correcting for such errors. Compensation is made by the simultaneous use of a second light beam that is tuned to respond to light losses except those from the metal being determined. If light is lost, it means there is some condition in the sample causing it, and an automatic correction is made to adjust the electronic measuring system.

In addition, the spectrophotometer can be computerized, enabling its data

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logging and processing system to receive input data continually from many sources. The data that have been forwarded into the system are then automatically printed out by a separate computer.

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Spectroradiometer probe

It is often necessary for researchers to study the effects of light levels, whether it be for the purpose of illuminating a scene or trying to discover light's effects on plants or animals, the response of the human eye or the reaction of some microorganisms.

Silicon is one of the most sensitive light detectors known and it has been incorporated as a light detector in a new spectroradiometer probe. It can measure light energy levels as low as 10^{-8} watts per square centimeter and as high as sunlight, or 1,000 watts per square centimeter. It can detect light in the spectrum from 4,000 angstroms in the visible range, to 11,000 angstroms in the near infrared.

The importance of the silicon is not only its ability to detect low-level light energy, but its stability, which enables it to respond just about the same way all the time with very slight variations over the years. The spectroradiometer is guaranteed to have a 10 percent absolute accuracy on any wavelength when compared with a standard light source from the National Bureau of Standards.

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Quartz manometer

Knowing correct air pressure is important in such diverse areas as plasma research, cell studies, cryogenics, the determination of specific heat and specific gravity, wind tunnel experiments and a host of other fields. An instrument has been devised that permits relatively untrained personnel to make such pressure measurements. The device, a quartz manometer, eliminates the need to make corrections for temperature and gravity. It is also compact and easy to handle, compared with a conventional mercury manometer, which consists of long tubes of mercury.

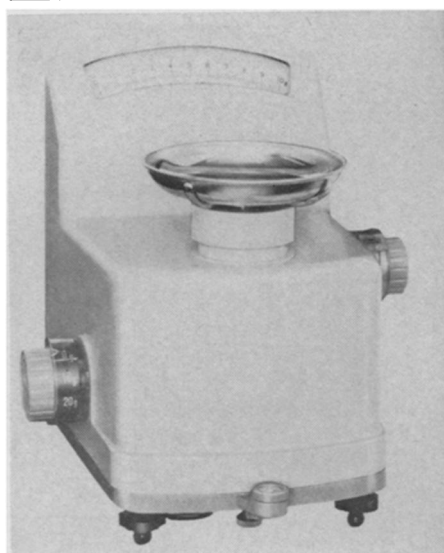
Capable of measuring air pressure as low as 1.9×10^{-5} pounds per square inch and as high as 500 pounds per square inch, the instrument relies on a fused quartz pressure-sensitive element. One quartz sensor is not enough to

measure such a large pressure range or to give pressure in different units; 20 interchangeable sensors are used.

Since quartz has good spring characteristics, it has been fashioned into a flattened spiral with a mirror affixed to one end. As the pressure changes, the spiral tightens or unwinds, rotating the mirror attached to it. A light beam aimed at the mirror is then deflected, and its change is picked up by an array of photoelectric cells. The amount of deflection corresponds to a specific atmospheric pressure. The deflected light activates a counting device, which is calibrated to the amount of deflection, thus giving a visual readout of the air pressure.

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Top-loading scale



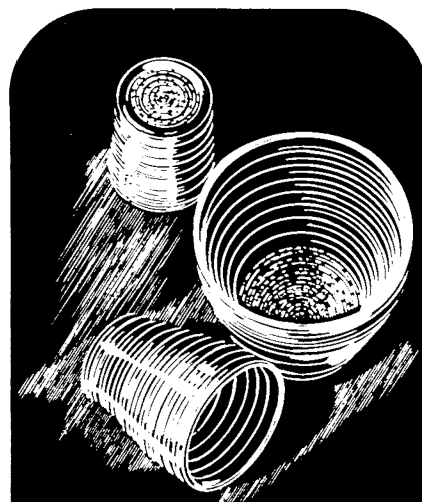
A low-cost top-loading scale has come out for those who do not do high precision weighing. This moderate-precision balance can be used by a wide range of people from students to chemists to photographers to biologists.

It is simple to operate. There are three models, the first measuring from in the 10 milligram to 50 gram range, the second from 20 milligrams to 100 grams and the third from 50 milligrams to 200 grams. The balances have a sensitivity of 0.05 grams per scale division.

An added feature of the scale is a silicone oil damper, which prevents the pointer from swinging back and forth, thus giving a fast reading.

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