4.9: Application

Learning Objectives

After completing this section, you should be able to

- who uses IR spectroscopy and why

Infrared spectroscopy, an analytical technique that takes advantage of the vibrational transitions of a molecule, has been of great significance to scientific researchers in many fields such as protein characterization, nanoscale semiconductor analysis and space exploration.

The most common application of IR spectroscopy is determining the functional groups present or absent in a molecule. Chemists often synthesize a molecule and need to determine if they made it or not and the presence or absence of a functional group could indicate whether or not the chemist made the molecule or not. For example, if one is performing a synthesis and oxidizes an alcohol to an aldehyde, the IR spectrum could help deduce quickly if you made the product or not. If the alcohol band disappears and the carbonyl band appears, this would be proof that the alcohol did in fact oxidize to the aldehyde. Since different molecules with different combination of atoms produce their unique spectra, infrared spectroscopy can be used to qualitatively identify substances. In addition, the intensity of the peaks in the spectrum is proportional to the amount of substance present, enabling its application for quantitative analysis.

Infrared spectroscopy is used across a wide variety of industries to monitor substances, since it is an simple and reliable technique. Environmental scientists use IR for detecting industrial pollutants. This can be to monitor air quality in big cities, such as Tokyo or London, to monitoring the methane levels in arctic circle. IR helps the environmental scientists study the pollutants or greenhouse gases and how it effects the everyday life.

In art conservation, IR spectroscopy is used to help identify what pigments, adhesives, fibers, plastics, and binders were used. The ability to know what molecular structures may be present in the artwork allows conservationists to determine the best way possible to preserve or clean the art. This helps the longevity of these important pieces of art and history persevere over time for many to enjoy and learn from.

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Outside Links

- NIST Chemistry WebBook: http://webbook.nist.gov/
- Wikipedia: http://en.Wikipedia.org/wiki/Infrared_spectroscopy
- Labmate: https://www.labmate-online.com/news/...troscopy/57765