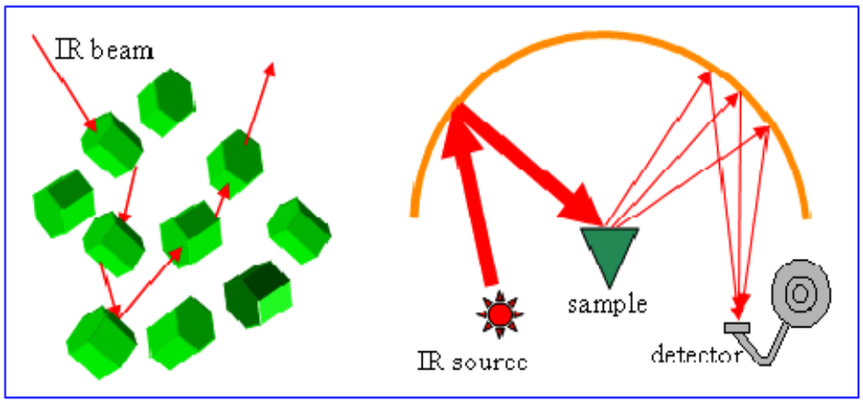
What is Diffuse Reflectance Spectroscopy?

Diffuse Reflectance Infrared Fourier Transform Spectroscopy (DRIFTS) is a technique that collects and analyzes scattered IR energy. It is used for measurement of fine particles and powders, as well as rough surface (e.g., the interaction of a surfactant with the inner particle, the adsorption of molecules on the particle surface). Sampling is fast and easy because little or no sample preparation is required.



When the IR beam enters the sample, it can either be reflected off the surface of a particle or be transmitted through a particle. The IR energy reflecting off the surface is typically lost. The IR beam that passes through a particle can either reflect off the next particle or be transmitted through the next particle. This transmission-reflectance event can occur many times in the sample, which increases the pathlength. Finally, such scattered IR energy is collected by a spherical mirror that is focused onto the detector. The detected IR light is partially absorbed by particles of the sample, bringing the sample information.

There are three ways to prepare samples for DRIFTS measurement:

- Fill the micro-cup with the powder (or the mixture of the powder and KBr).The diffuse reflectance accessory uses a focusing mirror to focus the beam on the sample surface and collect the IR energy. The micro-cup needs to be filled consistently in order to keep the focus.

- Scratch the sample surface with a piece of abrasive (SiC) paper and then measuring the particles adhering to the paper.

- Place drops of solution on a substrate. If colloids or powders are dissolved or suspended in a volatile solvent, you can place a few drops of the solution on a substrate, and then evaporate the solvent, subsequently analyze the remaining particles on the substrate.

It is well known that particle size is a key variable in a transmission measurement with the pellet method. Large particle will results in the scattering of the energy, leading to the shift of the spectrum baseline and the broadening of IR bands. The scenario becomes worse in a diffuse reflectance measurement, because the infrared light travels in the sample for a long period and the optics collects a large portion of the distorted energy. It is important to grind the sample particles to 5 microns or less.