**The Use of Polyethylene Disks in Far Infrared Spectroscopy**

Since NaCl and KBr are opaque below ~650 and ~380 cm-1, respectively, they cannot be used as window materials for far-infrared spectroscopy. Cesium iodide is transparent to about 150 cm-1 and hence can be used, not only as a window for measurements down to this wavenumber, but also for the preparation of alkali halide disks.

Silicon cuts on below 400 cm-1 and is often useful, although its high refractive index does lead to some loss of energy. Both quartz and sapphire also transmit at long wavelength. Diamond is transparent throughout the entire far-infrared. However, its small size and high cost prevents it from being a general-purpose window. The main use of bulk diamonds for far-infrared spectrometry has been as a window of a Golay detector. On the other hand, thin diamond films may be fabricated by chemical vapor deposition, have high strength and are not extortionately expensive.

The ***best general*** purpose window material for far-infrared spectroscopy is ***polyethylene.*** High-density polyethylene (HDPE) is often used as a window for gas and liquid cells; however, this material has a fairly weak crystal lattice mode at 72 cm-1. When windows are at least 5 mm thick, the transmittance of this band can be less than 50%. Low-density polyethylene (LDPE) has lower crystallinity than HDPE, so that this band is far weaker in LDPE than HDPE. As a result, however, LDPE is also less rigid and not as suitable as HDPE as a window material. The melting point of LDPE is about 140 °C and so this material is easily melted. One useful way of preparing solid samples for far-infrared spectroscopy is to grind them with powdered LDPE and compress the mixture while heating it to about 140 °C