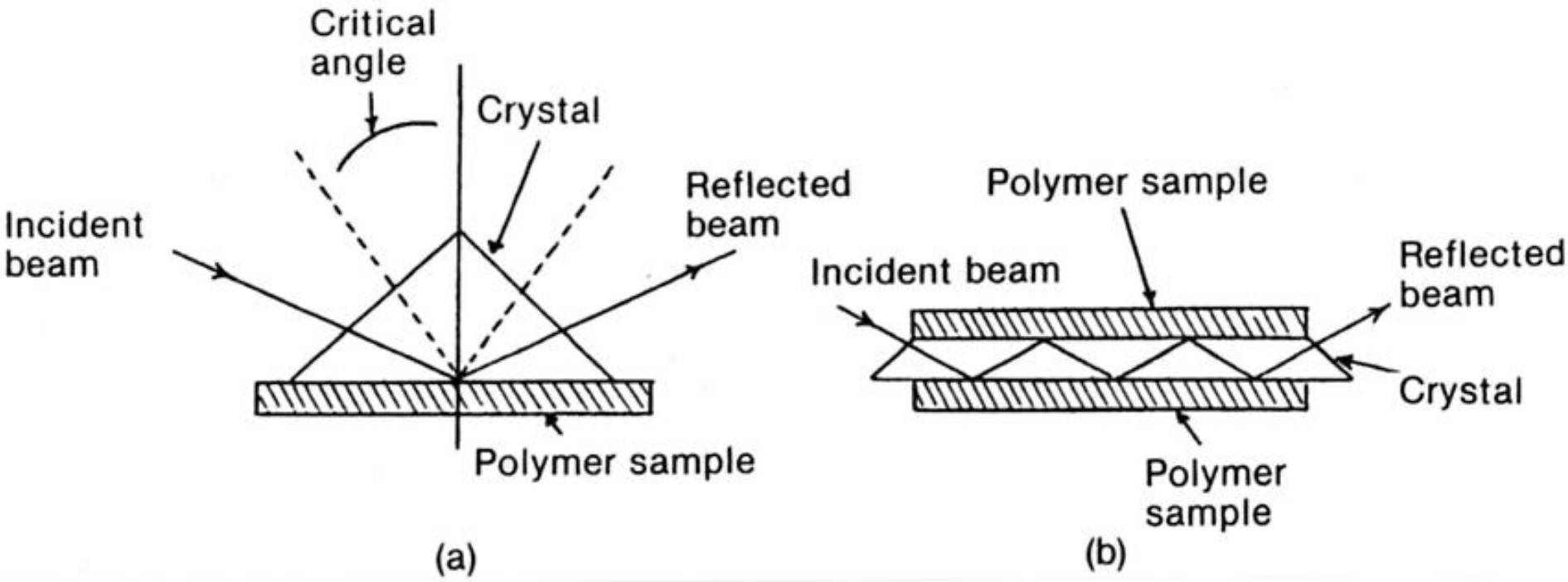
Fourier-Transform infrared (FTIR) spectroscopy

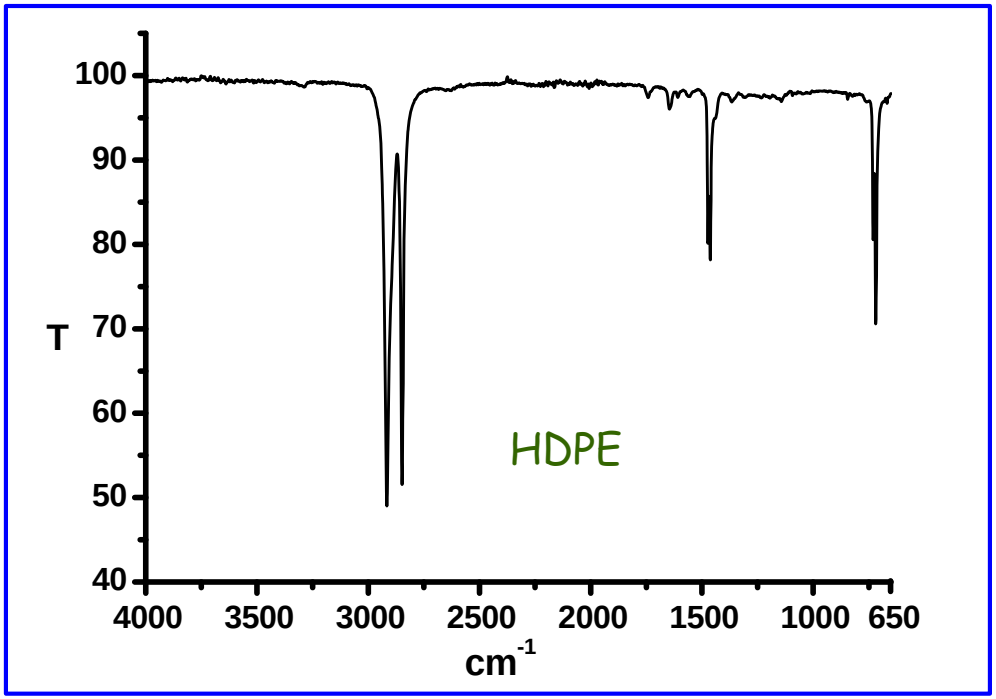
is a vibrational spectroscopy that records absorptions of IR light by chemical bonds in all molecules incl. polymers. Since different bonds absorb IR light at characteristic but different wavelengths FTIR spectroscopy is often referred to as fingerprint spectroscopy. As a consequence pure compounds have characteristic and unique FTIR spectra. In principle, all states of matter, *gas-liquid-solid*, can be analyzed. Since light transmittance through a sample is necessary (IR light should read the detector) very thin film material or a sample finely dispersed in a non-absorbing matrix normally needs to be prepared. With Attenuated Total Reflectance (ATR) a sample is forced in close contact with a reflecting surface (diamond) and sample preparation becomes very easy for polymers, thus non-dissolvable films or pellets can be analyzed directly.

Attenuated Total Reflectance (ATR)



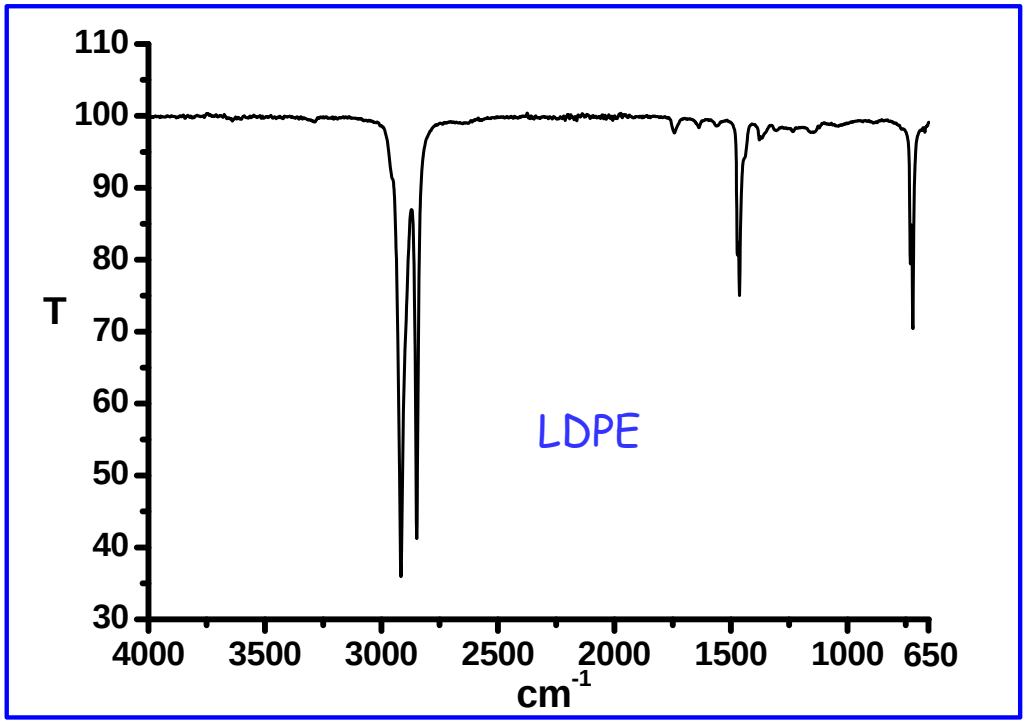
(a) Single reflection;
our diamond (placed in reversed position) cell can easily be exploited for both solid and liquid samples

(b) Multiple internal reflections;
good flexible polymer films or pastes and liquid (if only top space is exploited

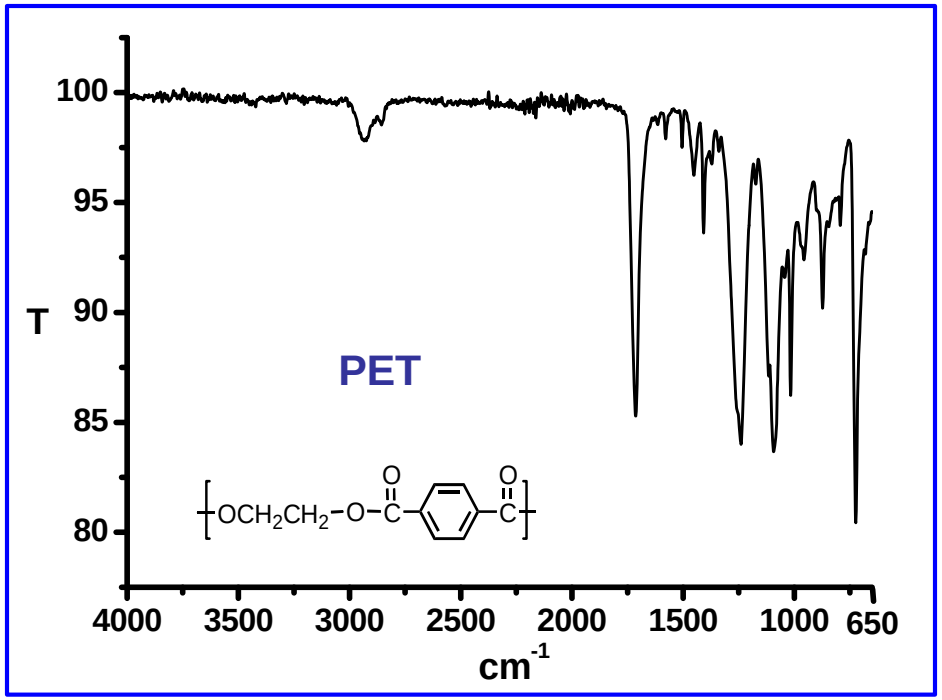


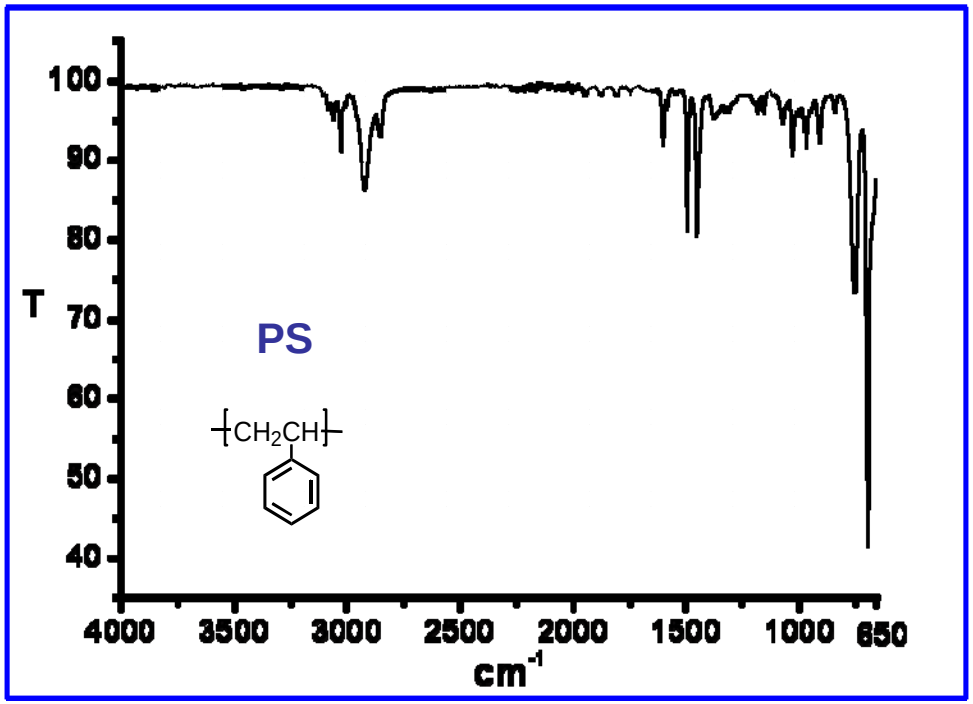
No real difference in FTIR spectra of HDPE & LDPE

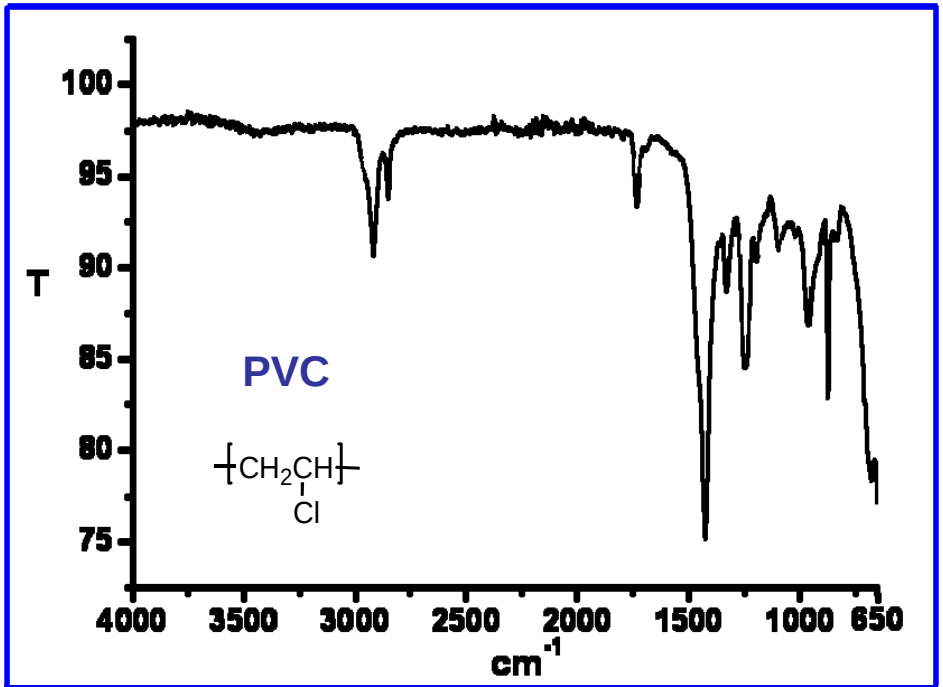
Therefore we need to rely on the simplest physical difference between HDPE & LDPE: *density*



FTIR spectra of some common polymers







Carbonyl absorption in PVC spectrum indicates presence of plasticizer