

§ 8.2.1 Characteristics of IR

1. Characteristics of IR

(1). When connected with some structural unit, the absorption frequency will appear in a certain range, and this range is called the characteristics absorption peak.

For Example:

Peaks of —CH_3 appear at $2800 \sim 3000 \text{ cm}^{-1}$

Peaks of —C=O appear at $1600 \sim 1850 \text{ cm}^{-1}$

(2). The chemical surroundings of the functional groups will change the peak position.

For Example:

$\text{—CH}_2\text{—CO—CH}_2\text{—}$ 1715 cm^{-1} Acetone

$\text{—CH}_2\text{—CO—O—}$ 1735 cm^{-1} Acetate

$\text{—CH}_2\text{—CO—NH—}$ 1680 cm^{-1} Acylamine

(3). Functional group can be determined for the peak position and intensity.

For Example:

If peak appears at 1700 cm^{-1} and there is no peak at around 3500cm^{-1} , it can be concluded that the compound is ketone or aldehyde.

2. IR spectrum can be classified to some sub-regions.

The frequency of functional groups always appear in the region ranging from $4000\sim 670\text{cm}^{-1}$.

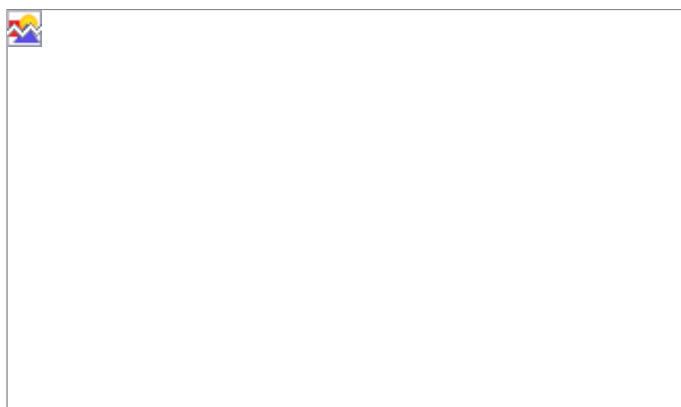
According to the vibration mode of functional groups, IR spectrum can be divided in 4 sub-regions.

(1). $4000\sim 2500\text{ cm}^{-1}$, X-H stretching region

(2). $2500\sim 1900\text{ cm}^{-1}$, triple bond, double bond stretching regio

(3). $1900\sim 1200\text{ cm}^{-1}$, double bond stretching region

(4). $1200\sim 670\text{ cm}^{-1}$, X-Y stretching, deformation vibration region



Key points: Application and theory of IR, the vibration equation and calculation, the vibration mode of each functional groups, factors that affect the peak positions.

Questions: There are 4 vibration modes for CO_2 molecule, but why there are only 2 peaks on its IR spectroscopy?

