

CHARACTERISTIC INFRARED ABSORPTION BANDS OF FUNCTIONAL GROUPS

Class of Compounds	Absorption, cm ⁻¹	Intensity	Assignment	Class of Compounds	Absorption, cm ⁻¹	Intensity	Assignment
Alkanes and Alkyls	2850-3000 1450-1470 1370-1390 1365 + 1395 (two bands) 715-725	s s m m w	C-H stretch C-H bend CH ₃ C-H bend -CH(CH ₃) ₂ or -(CH ₃) ₃ bend -(CH ₂) _n bend	Carboxylic Acids	2500-3500 1710-1715 1680-1710	s, broad s, broad s	O-H stretch C=O stretch C=O stretch
				Esters	aliphatic 1160-1210 acetates ~1240 aromatic 1250-1310	s-vs	O=C-O-C stretch
Alkenes	3020-3140 1640-1670 910 + 990 (two bands)	w-m vw-m m + s	=C-H stretch C=C stretch =C-H bend		1735-1750 1715-1730 1760-1790	s s s	C=O stretch C=O stretch C=O stretch
RCH=CH ₂							
RR'C=CH ₂	885-895	s	=C-H bend				
cis-RCH=CHR'	665-730	m-s, broad	=C-H bend	Acyl Chlorides			
trans-RCH=CHR'	960-980	s	=C-H bend	R-C(O)-Cl	1785-1815	s	C=O stretch
RCH=CR'R''	790-840	s	=C-H bend	Ar-C(O)-Cl	1770-1800	s	C=O stretch
Alkynes				Anhydrides			
R-C≡C-H	3265-3335 2100-2140 610-700	s, sharp m s, broad	≡C-H stretch C≡C stretch ≡C-H bend	R-C(O)-O-C(O)-R	~1750 + ~1815	s,s	C=O symmetric
				Ar-C(O)-O-C(O)-Ar	~1720 + ~1775 (both two bands)	s,s	& asym. stretch
R-C≡C-R'	2190-2260	vw-w	C≡C stretch	Nitriles			
Alkyl halides				R-C≡N	2240-2260	m-s	C≡N stretch
				C=C-C≡N or Ar-C≡N	2220-2240	s	C≡N stretch
R-F	1000-1350	vs	C-F stretch	Amines			
R-Cl	750-850	s	C-Cl stretch	R-NH ₂	~3400 + ~3500 (two bands) 1580-1650	w w-m	N-H symmetric & asym. stretch N-H bend
R-Br	500-680	s	C-Br stretch				
R-I	200-500	s	C-I stretch	RR'N-H	3310-33350	w	N-H stretch
Alcohols	3300-3400 1035-1050 1050-1085	s, broad m-s m-s	O-H stretch C-O stretch C-O stretch	Amides			
R-CH ₂ -OH (1°) or C=C-CH(R)-OH				R-C(O)-NH ₂	3200-3400 and 3400-3500 (two bands) 1650-1690 1590-1655	w-m s, broad m-s	N-H symmetric & asym. stretch C=O stretch N-H bend
RR'CH-OH (2°) or C=C-CRR'-OH	1085-1125	m-s	C-O stretch				
RR'R''C-OH (3°)	1125-1205	m-s	C-O stretch	R-C(O)-NH-R	3400-3500 1640-1690 1510-1560	w-m s, broad m-s	N-H stretch C=O stretch N-H bend
Ar-O-H	1180-1260	m-s	C-O stretch				
Ethers				R-C(O)-NR'R''	1630-1680	m-s	C=O stretch
R-O-R'	1085-1150	s	C-O-C stretch	Nitro Compounds			
Ar-O-R	1020-1075 and 1200-1275 (two band)	m-s	=C-O-C sym. & asym. stretch	R-NO ₂	~1550 and ~1370 ~1525 and ~1335 (both two bands)	s s s	N-O symmetric & asym. stretch N-O symmetric & asym. stretch
Aldehydes	2700-2725 1720-1740 1685-1710	m s s	H-C=O stretch C=O stretch C=O stretch	Aromatic Compounds	3010-3100 1450-1600 (two to four bands)	m m-s sharp	Ar C-H stretch ring C=C stretch
				monosubstituted	730-770 and 690-710 (two bands)	s s	C-H bend C-H bend
Ketones				<i>o</i> -disubstituted	735-770	s	C-H bend
RR'C=O	1710-1720	s	C=O stretch	<i>m</i> -disubstituted	750-810 and 690-710	s s	C-H bend C-H bend
C=C-C(O)-R	1665-1685	s	C=O stretch				
Ar-C(O)-R	1675-1695	s	C=O stretch	<i>p</i> -disubstituted	810-840	s	C-H bend
four member cyclic	1770-1780	s	C=O stretch				
five member cyclic	1740-1755	s	C=O stretch				
six member cyclic	1710-1720	s	C=O stretch				

Intensity abbreviations: vw = very weak, w = weak, m = medium, s = strong, vs = very strong