

vibration region at 700–800 cm^{-1} from the uncomplexed ligand, indicating that no bonding occurred to the sulfur atom [27].

Tables 1 and 2 tabulate the low-frequency absorptions for 2,2'-DTDP, $^{\text{NA}}\text{ZnCl}_2 \cdot (2,2'\text{-DTDP})$, $^{64}\text{ZnCl}_2 \cdot (2,2'\text{-DTDP})$, and for the zinc complexes containing the zinc isotopes of mass 64 and 68. Figure 1 depicts the spectra of isotopic zinc halide complexes from 325–100 cm^{-1} .

Table 1. Observed frequencies (cm^{-1}), isotopic shifts, and band assignments for $\text{ZnCl}_2 \cdot (2,2'\text{-DTDP})$

2,2'-DTDP	$^{\text{NA}}\text{ZnCl}_2 \cdot (2,2'\text{-DTDP})$	$^{64}\text{ZnCl}_2 \cdot (2,2'\text{-DTDP})$	$^{68}\text{ZnCl}_2 \cdot (2,2'\text{-DTDP})$	$\bar{\nu}(^{64}\text{Zn}) - \bar{\nu}(^{68}\text{Zn})$	Assignments
622(s, p)	648(m, sp)	648	648	0	Ligand and ligand induced
	648(m, sp)	641	641	0	
471(m, sp)	499(m, sp)	500	501	-1	
	487(m, sp)	488	487	1	
429(m, sp)	429(m, sp)	429	429	0	
	417(s, sp)	417	417	0	
345(s, sp)	345(w)				
	321(vs)	322	321	1	
	293(vs)	294	291	3	
254(vvw)	242(m)	242	242	0	
	231(m)	231	231	0	
	222(m)	224	220	4	$\nu\text{Zn}-\text{N}$
	158(m)	—	—	—	
158(w)	130(s), 121(sh)	130	129	1	Ligand, $\delta\text{Zn}-\text{Cl}$ and lattice vibrations
	108(m)	108	108	0	

Abbreviations: s = strong; sp = sharp; m = medium; w = weak; v = very; sh = shoulder.

Table 2. Observed frequencies (cm^{-1}), isotopic shifts, and band assignments for $\text{ZnBr}_2 \cdot (2,2'\text{-DTDP})$

2,2'-DTDP	$^{\text{NA}}\text{ZnBr}_2 \cdot (2,2'\text{-DTDP})^*$	$^{64}\text{ZnBr}_2 \cdot (2,2'\text{-DTDP})$	$^{68}\text{ZnBr}_2 \cdot (2,2'\text{-DTDP})$	$\bar{\nu}(^{64}\text{Zn}) - \bar{\nu}(^{68}\text{Zn})$	Assignments
622(s, sp)	646(m, sp)	646	646	0	Ligand and ligand induced
	639(m, sp)				
471(m, sp)	499(m, sp)	501	500	1	
	486(m, sp)	488	488	0	
429(m, sp)	429(m, sp)	429	429	0	
	417(s, sp)	418	417	1	
345(s, sp)	320(m)	320	320	0	
	247(vs)	248	244	4	
223(s)	226	221	5		
200(s)	201	197	4		
158(w)	152(vw)	—	—	—	Ligand and lattice vibrations
	133(vw), 120(vw)	133	133	0	
	113(vw)	—	—	—	
	98(m)	100	99	1	

Abbreviations: s = strong; sp = sharp; m = medium; w = weak; v = very; sh = shoulder.

* The observed i.r. frequencies for the $^{\text{NA}}\text{ZnI}_2 \cdot (2,2'\text{-DTDP})$ complex from 650–80 cm^{-1} are 648(m), 528(vvw), 487(s, sp), 438(w), 433(w), 421(s, sp), 417(s, sp), 348(w), 314(s), 240(m), 231(m), 213(m), 194(s), 185(s), 162(m), 140(vw), 115(vvw), 100(vvw), 84(m). No band assignments were made for this compound since no isotopic studies were conducted for it.

[27] P. C. H. MITCHELL and R. J. P. WILLIAMS, *J. Chem. Soc.* 1912 (1960).