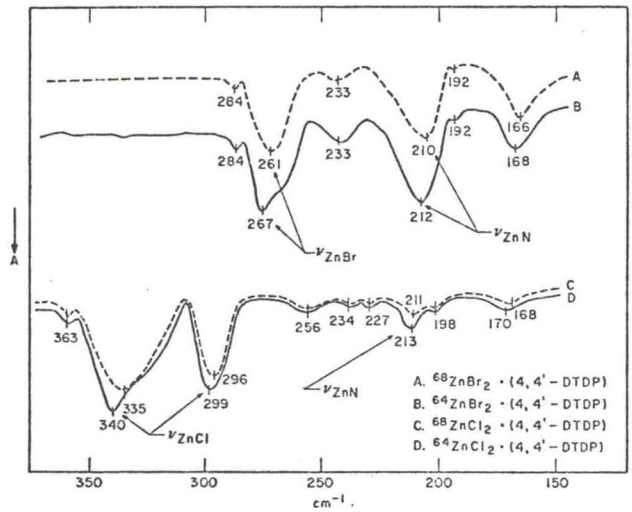

Fig. 2. Infrared spectra in the region 350–150 cm^{-1} for the isotopic $ZnCl_2 \cdot (4,4'\text{-DTDP})$ and $ZnBr_2 \cdot (4,4'\text{-DTDP})$ complexes.

Table 4. Observed frequencies (cm^{-1}), isotopic shifts, and band assignments for $ZnCl_2 \cdot (4,4'\text{-DTDP})$

4,4′-DTDP	$^{NA}ZnCl_2 \cdot (4,4'\text{-DTDP})$	$^{64}ZnCl_2 \cdot (4,4'\text{-DTDP})$	$^{68}ZnCl_2 \cdot (4,4'\text{-DTDP})$	$\tilde{\nu}(^{64}Zn) - \tilde{\nu}(^{68}Zn)$	Assignments
533(s, sp)	551(vvw)	549	549	0	
		536	—	—	
500(sh)	499(s, sp)	498	498	0	Ligand and ligand induced
488(s, sp)	486(s, sp)	485	486	−1	
438(m)	446(w)	445	445	0	
414(m)	409(vvw)	409	409	0	
379(w)	363(vw)	363	363	0	
343(vw)	341(s)	340	335	5	$\nu ZnCl_{asym}$
281(vvw)	299(s)	299	296	3	$\nu ZnCl_{sym}$
	256(m)	256	256	0	
	235(w)	234	234	0	Ligand induced
		227	227	0	
183(vvw)	213(m)	213	211	2	νZn—N
	199(vvw)	198	198	0	Ligand
	170(m)	170	168	2	
	154(vvw, br)				
	113(m)	114	112	2	Lattice

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

4,4′ DTDP, $^{NA}ZnCl_2 \cdot (4,4'\text{-DTDP})$, $^{NA}ZnBr_2 \cdot (4,4'$ DTDP), and for the zinc complexes containing the zinc isotopes of mass 64 and 68.

For the $ZnCl_2 \cdot (4,4'\text{-DTDP})$ complex it was observed that the 341 and 299 cm^{-1} absorptions are metal and halogen sensitive. For the $ZnBr_2 \cdot (4,4'\text{-DTDP})$ complex the 264 cm^{-1} absorption is also metal- and halogen-sensitive. Thus, these bands may be assigned as metal–halogen stretching vibrations. These vibrations occur in a region normal for terminal zinc–halogen stretching modes associated with a tetrahedral environment for the zinc atom [28]. The band at ~212 cm^{-1} in both the chloride and bromide is sensitive only to metal and may be assigned as the metal–nitrogen stretching vibration.