

Answer on Question #41358, Chemistry, Physical Chemistry

Question.

Which of the following carbonyls will have the strongest C–O bond?

- (1) $\text{Fe}(\text{CO})_5$
- (2) $\text{Mn}(\text{CO})_6^+$
- (3) $\text{Cr}(\text{CO})_6$
- (4) $\text{V}(\text{CO})_6^-$

Solution.

The weakening of the C-O bond is indicated by a decrease in the frequency of the ν_{CO} band(s) from that for free CO (2143 cm^{-1}).

| # | Compound | $\nu(\text{CO}), \text{cm}^{-1}$ |
|---|----------------------------|----------------------------------|
| 1 | $\text{Fe}(\text{CO})_5$ | 2034 |
| 2 | $\text{Mn}(\text{CO})_6^+$ | 2090 |
| 3 | $\text{Cr}(\text{CO})_6$ | 2000 |
| 4 | $\text{V}(\text{CO})_6^-$ | 1860 |

According to this data, $\text{Mn}(\text{CO})_6^+$ has the strongest C-O bond.