Investigation of IR-Spectra of \textit{N}-Benzoyl-\textit{N}-phenylhydroxylamine in Carbon Tetrachloride

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Spectra of carbon tetrachloride solutions of \textit{N}-benzoyl-\textit{N}-phenylhydroxylamine in concentrations between $1 \times 10^{-4}$ and $25 \times 10^{-4}$ M, in the spectral range from 2800 cm\(^{-1}\) to 4000 cm\(^{-1}\) were measured. Appearance of the absorption band at 3070 cm\(^{-1}\) is ascribed to C–H stretching, and the band at 3250 cm\(^{-1}\) to H...O–H bond. The validity of Beer’s law for the band at 3250 cm\(^{-1}\) and the fact that no bands between 3400 and 4000 cm\(^{-1}\) were detected indicate the presence of an intramolecular H bond.

Recently \textit{N}-benzoyl-\textit{N}-phenylhydroxylamine (BPH) has been applied for the solvent extraction of some elements\(^\text{1,2}\).

In our determination\(^\text{3}\) of equilibrium constants for complexes of vanadium with BPH, we used nonpolar organic solvents. In this respect it was important to know the behaviour of BPH in such solvents.

BPH is a polar molecule capable of forming hydrogen bonds. This may lead to strong selfassociation in non-polar organic solvents. IR spectroscopy was used to show the type of hydrogen bonding.

Spectra of solutions of BPH in CCl\(_4\) at concentrations from $1 \times 10^{-4}$ to $25 \times 10^{-4}$ M were measured. A 102.6 mm cell with glass windows about 0.8 mm thick was used. The spectra were obtained with a VEB Carl Zeiss, Jena, double beam IR spectrophotometer Model UR-10. The spectral slit width ranged from 2 to 4 cm\(^{-1}\).

In the spectral range from 2800 cm\(^{-1}\) to 4000 cm\(^{-1}\) two absorption bands were detected, at 3070 cm\(^{-1}\) and 3250 cm\(^{-1}\) (Fig. 1). From the analogy of these bands and literature data\(^\text{4-7}\), we ascribed the band at 3070 cm\(^{-1}\) to C–H stretching and the band at 3250 cm\(^{-1}\) to the intramolecularly bonded OH group. The fact that no bands between 3400 and 4000 cm\(^{-1}\) were detected indicates the absence of free OH groups and hence intramolecular bonding.

This is further substantiated by the fact that the plot of the absorption intensity at 3250 cm\(^{-1}\) vs. BPH concentration in CCl\(_4\) gives a straight line (Fig. 2).

Hence, it is concluded that at these concentrations of BPH no association takes place.
Fig. 1. IR absorption spectrum of $8 \times 10^{-4} \text{M BPH solution in CCl}_4$.

Fig. 2. Calibration curve for the BPH solutions in CCl$_4$ at 3250 cm$^{-1}$.

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REFERENCES


IZVOD

Ispitivanje IR spektra N-benzoil-N-fenilhidroksilamina

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Snimljeni su IR spektri N-benzoil-N-fenilhidroksilamina u ugljen tetrahloridu za koncentracije od $1 \times 10^{-4}$ do $25 \times 10^{-4} \text{M}$, i u spektralnoj oblasti od 2800 do 4000 cm$^{-1}$. Pojava trake na 3070 cm$^{-1}$ pripisuje se C—H istezućoj vibraciji, a trake na 3250 cm$^{-1}$ O...H...O vezi. Utvrđeno je da za traku na 3250 cm$^{-1}$ važi Beer-ov zakon što, pored odsustva traka u oblasti od 3400 do 3700 cm$^{-1}$, ukazuje na postojanje intramolekulske vodonične veze.

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