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## Calorimetric and infrared study of methyl iodide and some monosubstituted butyl halides. Does methyl iodide form hydrogen bonds as a proton donor?

Borisover M., Stolov A., Baitalov F., Morozov A., Solomonov B.  
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

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### Abstract

The solution enthalpies of methyl iodide, n- and t-butyl chlorides, n- and t-butyl iodides in cyclohexane, carbon tetrachloride, acetone and dimethyl sulfoxide (DMSO) were measured calorimetrically and the transfer enthalpies of the solutes from cyclohexane were calculated. The comparative analysis of the transfer enthalpies shows no remarkable differences that could be attributed to specific interaction between the solvents and the solutes. In addition, the infrared (IR) spectra of the butyl halides dissolved in CCl<sub>4</sub> and deuterated DMSO, and the IR spectra of methyl iodide in CCl<sub>4</sub>, deuterated acetonitrile, acetone and DMSO, were investigated. Significant enhancement of the CH<sub>3</sub> stretching band intensity was observed for methyl iodide solutions when going from carbon tetrachloride to H-bond-acceptor solvents. This enhancement can be ascribed to the hydrogen bonding of methyl iodide with the solvents. Meanwhile, no IR spectroscopic evidence of such hydrogen bonding was observed when the solutions of n- and t-butyl halides in organic solvents were considered. A possible reason for the disagreement between the IR and calorimetric measurements is discussed.

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### Keywords

Hydrogen bonding, Intermolecular interactions, IR spectra, Methyl iodide, Solvation