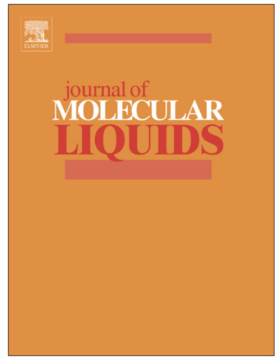

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Ozone Solvatochromism in Selected Solvents

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Abstract

The solvatochromism of the ozone Hartley band was studied in 21 different liquids divided in 16 solvents and 5 acids. In all the liquids studied ozone shows a positive solvatochromism, i.e. a red shift or batochromic shift as function of the polarity of the solvents. In fact, correlations were found between the shift of the ozone band and the polarity of the solvents described by the Onsager polarity function $f(n^2)$ or by the solvent polarity parameter $E_T(30)$ measured according to Reichardt and Dimroth. The excited dipole moment of ozone was estimated from the experimental data. The ozone solvatochromism in 5 acids including concentrated sulfuric acid and the superacid trifluoromethanesulfonic acid was studied.

Key Words: Ozone; Solvatochromism; Dipole moment; Electronic absorption spectroscopy

1. Introduction

The ozone electronic spectrum is characterized by the strong Hartley band at about 255 nm followed by the considerably weaker bands at longer wavelengths, i.e. the Huggins and the Chappuis bands respectively between 300 and 360 nm and between 400 and 650 nm [1,2,3]. Ozone plays a major role in atmospheric chemistry [4,5]. However ozone is also a key pollutant at the ground level causing health problems [6] and premature aging and degradation of materials [7,8]. Ozone is an important reagent in organic chemistry [9] and moreover in industrial applications starting from water and wastewater treatment [10,11]. Ozone is characterized by a good solubility in water [11,12], diluted Bronsted acids [13] as well as in organic solvents [14,15] and fluorinated solvents [16]. Furthermore, ozone is able to form charge-transfer complexes with simple molecules [17,18] and moreover with water [19,20]. The photolysis of the ozone-water complex has implications in the atmospheric chemistry as source of the OH radical [21]. Despite the numerous studies on ozone solubility and complexes there are no papers available dedicated uniquely to the solvent effects on the electronic spectrum of ozone and in particular to the Hartley band. In other