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RESEARCH ARTICLE

ASSOCIATION OF RHODAMINE B BASE WITH β-CYCLODEXTRIN: PROTON NMR STUDY

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ABSTRACT

By using the dyes it is now possible to confirm the structure of the complex formed between the β-cyclodextrin and Rhodamine B base. The Proton NMR studies were carried out with pure dye, rhodamine B base and with 1: 1 inclusion complex of rhodamine B base and β-cyclodextrin. The change in chemical shift values confirm the formation of inclusion complex of Rhodamine B base with β-cyclodextrin.

INTRODUCTION

NMR is of interest mainly to physicists and chemistry. NMR spectroscopy is the name given to a technique which exploits the magnetic properties of certain nuclei. In principle, NMR is applicable to any nucleus possessing spin. NMR technique consists in exposing the protons in an organic molecule to a powerful field. The protons will process at different frequencies. Now we irradiate these processing protons will steadily changing frequencies and observe the frequency at which absorptions occur. It is generally more convenient to keep the radio frequency constant and the strength of the magnetic field is constantly varied. At some value of the fields strength, the energy required to flip the protons matches the energy of the radiation. Absorption occurs and a signal is observed such a spectrum is called nuclear magnetic resonance spectrum. The most important applications are proton NMR (^{1}HNMR) and carbon – (^{13}C NMR) NMR spectroscopy. Nuclear magnetic resonance (NMR) spectra of dyes in free and complexed form indicated the probable structure of the complex judging from the proton shifts of the included groups of dyes in the CD cavity. By forming a 1:1 supramolecular complex of Dapsone (DDS) with β-cyclodextrin (βCD) both in the absence and presence of linear alcohols, the apparent association constants were measured using a steady-state fluorescence method (Li Ma *et al.,* 2002). Inclusion complex of trazodone hydrochloride with hydroxyl propyl-β-cyclodextrin was investigated by Misiuk *et al.* (2009). Absorption and fluorescence emission of 4 and 7 substituted coumarines were studied in various polar and non-polar organic solvents (Vijay and Sharma *et al.,* 2003).

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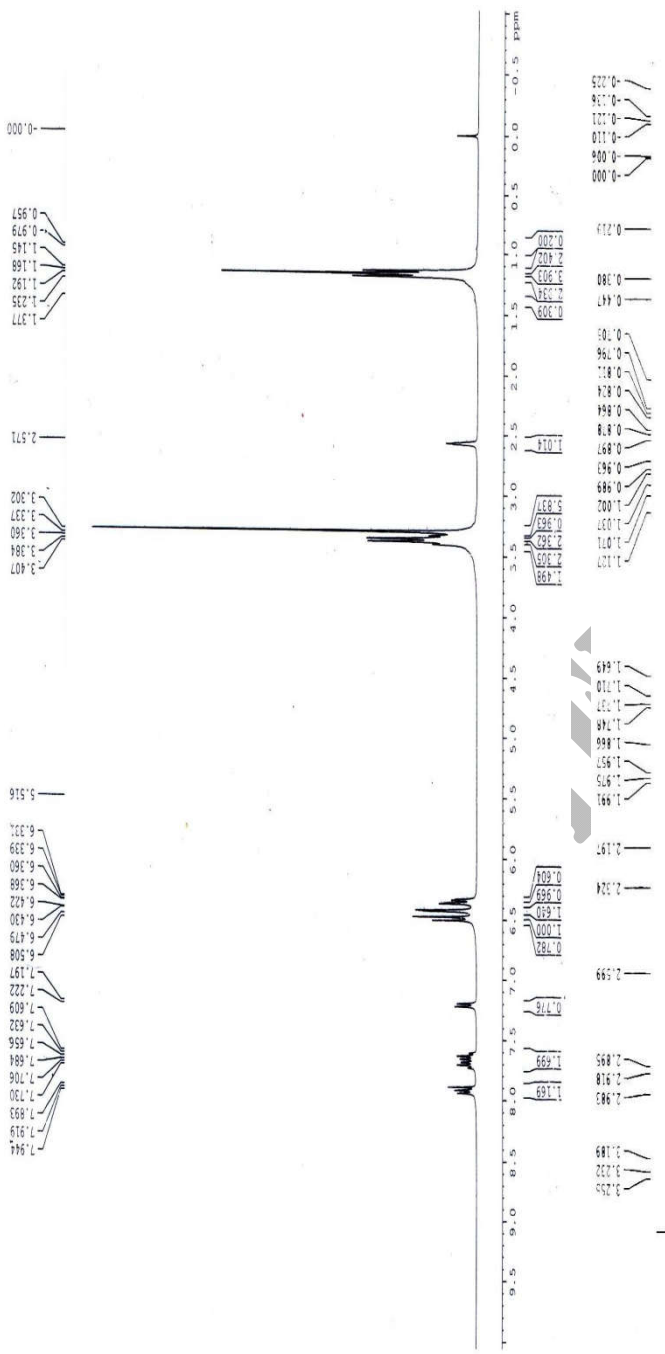

Fig. 1. ^{1}H NMR spectra of Rh B base

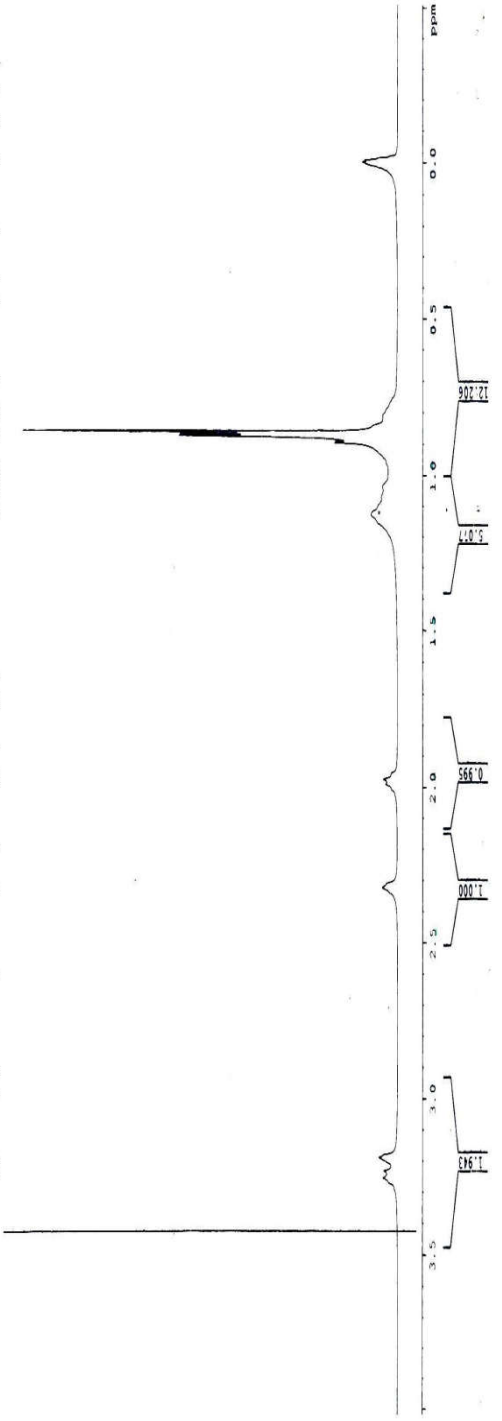

Fig. 2. ^{1}H NMR spectra of βCD

The inclusion complex of 2ABA with βCD is discussed by semi empirical quantum calculations (AMI), absorption, emission, FTIR, ^{1}HNMR and scanning electron microscope (SEM) (Stalin *et al.,* 2006). Effect of β-cyclodextrin, solvents and buffer solutions of different pH on the absorption and fluorescence spectra of 3 amino benzoic acid (3ABA) were investigated (Stalin *et al.,* 2006(a)). Association constants of dibenzo (3n + 2) crown-in ethers using steady-state fluorescence spectroscopy were determined by Tuncer and Erk (2005).

MATERIALS AND METHODS

Rhodamine B base and β-Cyclodextrin were purchased from sigma Aldrich company, Bangalore. They were used without further purification. The instrument employed is Bruker 300 MHz (ultrashield) NMR spectrometer, which operates at 33MHz for proton and 75 MHz for BC Nuclei respectively, available at Department of Organic Chemistry, Madurai Kamaraj University, Madurai.

RESULTS AND DISCUSSION

^{1}HNMR studies were carried out at room temperature and under identical experimental conditions. Proton nuclear magnetic resonance (^{1}H NMR) spectroscopy has proved to be a useful tool to study β-cyclodextrin inclusion complexes (Lehman and Peter, 1991; Agbara *et al.,* 1989, Turro *et al.,* 1980). The resonance assignments of the protons in β-cyclodextrin are well established. ^{1}HNMR spectra of Rhodamine B base, β-cyclodextrin and the 1: 1 inclusion complex of Rhodamine B base and β-cyclodextrin are given in Figs. 1, 2 and 3 respectively. The chemical shift values are presented in Table 1.

Conclusion

It is assumed that Rhodamine B base molecules not only interact with β-cyclodextrin and also form the inclusion complex of Rhodamine B base with β-cyclodextrin. The change in chemical shift values conform the complex formation.

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