



Solvent Effect on Protonation Constants of Erythromycin in Different Aqueous Solutions of Methanol and Ethanol

Mohammadreza DOLATYAR¹, Farhoush KIANI^{1,*}, Ali FARAJTABAR², Fardad KOOHYAR^{3,4,*},
Azade G. H. SARAEI⁵ & Yaser ABROONTAN¹

¹ Department of Chemistry, Faculty of Science, Ayatollah Amoli Branch, Islamic Azad University, Amol, Iran

² Department of Chemistry, Jouybar Branch, Islamic Azad University, Jouybar, Iran

³ Division of Computational Physics, Institute for Computational Science, Ton Duc Thang University,
Ho Chi Minh City, Vietnam

⁴ Faculty of Applied Sciences, Ton Duc Thang University, Ho Chi Minh City, Vietnam

⁵ Department of Agriculture of Food Science Engineering, Ayatollah Amoli Branch,
Islamic Azad University, Amol, Iran

SUMMARY. The protonation constants of erythromycin were measured in binary mixtures of water+metanol and water+ethanol containing 0, 10, 20, 30, 40 and 50% (v/v). These measurements were done using the potentiometric method at T = 25 °C and constant ionic strength (0.1 mol.dm⁻³ of sodium perchlorate). The protonation constants were analyzed using Kamlet-Abboud-Taft (KAT) and normalized polarity parameters (ETN). Dual-parameter correlation of pK_a versus π* (dipolarity/polarizability) and α (hydrogen-bond donor acidity) as well as pK_a versus π* and β (hydrogen-bond acceptor basicity) gave a good results in mixed solvents of water+methanol and water+ethanol. There is a linear relationship between acidic dissociation constants and mole fraction of alcohol in solvent mixture water+methanol. In this research work, we discussed the solvent effect and dielectric of the area on the acidic dissociation constants of erythromycin.

RESUMEN. Las constantes de protonación de eritromicina se midieron en mezclas binarias de agua+metanol y agua+etanol que contenían 0, 10, 20, 30, 40 y 50% (v/v). Estas mediciones se realizaron utilizando el método potenciométrico a T = 25 °C y fuerza iónica constante (0,1 mol.dm⁻³ de perclorato de sodio). Las constantes de protonación se analizaron utilizando Kamlet-Abboud-Taft (KAT) y parámetros de polaridad normalizados (ETN). La correlación de doble parámetro de pK_a versus π* (dipolaridad/polarizabilidad) y α (acidez del donante de enlaces de hidrógeno), así como pK_a versus π* y β (basicidad del aceptor de enlaces de hidrógeno) dio buenos resultados en disolventes mixtos de agua+metanol y agua+etanol. Existe una relación lineal entre las constantes de disociación ácidas y la fracción molar del alcohol en la mezcla de disolventes agua+metanol. En este trabajo discutimos el efecto solvente y dieléctrico del área sobre las constantes de disociación ácidas de la eritromicina.

KEY WORDS: erythromycin, ethanol, methanol, potentiometry, solvent effect.

* Author to whom correspondence should be addressed. E-mail: fardadkoohyar@tdtu.edu.vn (Fardad Koohyar); Farhoush_kiani@yahoo.com (Farhoush Kiani)