Exploring pK_a of Peroxycitric Acid Coexisting with Citric Acid in Aqueous Solution with Voltmmetric, Potentiometric and Chromatographic Approaches

Begum Nadira Ferdousi^{1,*}, Md. Mominul Islam², Takeyoshi Okajima³ and Takeo Ohsaka^{3,4,*}

¹ Department of Arts and Sciences, Ahsanullah University of Science and Technology, 141-142 Love Road, Tejgaon, Dhaka 1208, Bangladesh

² Department of Chemistry, Faculty of Science, University of Dhaka, Dhaka 1000, Bangladesh

³ Department of Electronic Chemistry, Interdisciplinary Graduate School of Science and Engineering, Tokyo Institute of Technology, Mail Box G1-5, 4259 Nagatsuta, Midori-ku, Yokohama 226-8502, Japan

⁴ Present Address: Research Institute for Engineering, Kanagawa University, 3-27-1 Rokkakubashi, Kanagawa-ku, Yokohama 221-8686, Japan

*E-mail: ohsaka@echem.titech.ac.jp, bnferdousi@yahoo.com

doi: 10.20964/2016.07.30

Received: 16 March 2016 / Accepted: 13 May 2016 / Published: 4 June 2016

pK_a value of peroxycarboxylic ($-COOOH$) group of peroxycitric acid (PCA) without separating from the coexisting citric acid (CA) in aqueous solution could be successfully determined with voltammetric, chromatographic and potentiometric titration methods. Effect of solution pH on cyclic voltammetric reduction of $-COOOH$ group of PCA was evaluated. Reversed phase HPLC was employed to recognize the pK_a zones of PCA and the result was found to support the voltammetric determination of the pK_a value. pH-metric titrations of CA and the mixture of PCA and CA were carried out and an independent titration curve of PCA was derived *via* the interpolation method. Titration results were analyzed by Niels Bjerrum graphical method to estimate the three pK_a values for each of PCA and CA. A brief discussion on the pK_a values of PCA is rationally given with the support of *ab initio* molecular orbital calculations on the optimized structures of CA and PCA.

Keywords: Peroxycitric acid; Citric acid; pK_a ; Cyclic voltammetry; Niels Bjerrum method

[FULL TEXT](#)

© 2016 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).