Quantitative Determination of Kaempferol by using a novel B-Z Chemical Oscillating system Catalyzed by a Cu (II)-tetraazamacrocyclic Complex

Saif Ullah¹, Rooh Ullah^{2,*}, Rasha M.K. Mohamed^{3,4}, Gang Hu^{1,5,*}, Ateeq ur rehman², Muhammad Yasir Nawabi¹, Asif Hayat⁶, Ata Ur Rehman⁷, Mehboob Hassan⁸, Ikram Uddin⁹, Syed Attaullah Shah¹⁰, Muhammad Zahir Shah¹¹ and Jimei Song¹

¹ Department of Chemistry, Anhui University, Hefei, 230601, People's Republic of China

² Department of Natural and Basic Sciences, University of Turbat, Baluchistan, Pakistan

³ Department of Chemistry, College of Science, Jouf University, P.O.Box: 2014, Sakaka, Saudi Arabia

⁴ Department of Chemistry, Faculty of Science, Assiut University, P.O.Box: 71515, Assiut Egypt

⁵ Anhui province key laboratory of chemistry for Inorganic/Organic Hybrid functionalized materials

⁶ Collages of Chemistry, Fuzhou University, Fuzhou 350002, China

⁷ Functional Materials Laboratory (FML), School of Materials Science & Engineering, Xian University of Architecture and Technology, Xian, Shaanxi, 710055, China

⁸ Department of Chemistry, Northeast University, Changchun, Jilin Province 130024, P.R. China

⁹ CAS Key Laboratory of Science and Technology on Applied Catalysis, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian 116023, P.R. China

¹⁰ Department of Chemistry, Mugla Sitki kocman University, 48100 Mugla, Turkey

¹¹ Key Laboratory of Synthetic and Natural Functional Molecule Chemistry of Ministry of Education, & Materials Science, Northwest University, Xian, 710069, P.R. China

*E-mail: roohullah@uot.edu.pk

doi: 10.20964/2020.12.37

Received: 1 August 2020 / Accepted: 17 September 2020 / Published: 31 October 2020

An appropriate analytical technique for determination of kaempferol (KMF) by its perturbation effect on Belousov-Zhabotinskii (B-Z) oscillating system was reported. The macrocyclic copper (II) complex [CuL] (ClO₄)₂ was used as a catalyst while malic acid as substrate in B-Z system. The ligand L in the macrocyclic-complex is 5, 7, 7, 12, 14, 14-hexamethyl-1, 4, 8, 11-tetraazacyclotetradeca-4, 11-diene. Experimental outcomes shown the perturbation effect of KMF could cause the change in the amplitude of oscillation (ΔA) which was directly related to its concentration (2.5×10^{-6} to 3.0×10^{-4} mol/L) with correlation coefficient of 0.99315. The calculated relative standard deviation (RSD) is 3.1 % by eight samples (1.8×10^{-5} mol/L) and the observed lower limit of detection is 1.25×10^{-6} mol/L. The cyclic voltammetry (CV) experiments were used to confirm the redox reaction between kaempferol and sodium bromate. Furthermore, the reaction perturbation mechanism was derived from the well-known FKN (Field-Koros-Noyes) oscillation mechanism.

Keywords: Antioxidant; Belousov-Zhabotinskii; Chemical Oscillator; Kaempferol; Oscillation Amplitude

[FULL TEXT](#)

© 2020 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/>).