A Spectroscopic and Kinetic Investigation on the Substitution of Fe(III) for Ni(II) in a Siderophore Model

Wagner J. Barreto, Waléria P. Silva, Ieda S. Scarmínio, Sônia R. Giancoli Barreto, and Luís F. Stucchi Silva

a Laboratory of Environmental Physical Chemistry, CCE, Department of Chemistry, Londrina State University, CP 6001, 86051990, Londrina, Paraná, Brasil
b Laboratory of Chemometry in Natural Sciences, Departamento de Química, CCE, Universidade Estadual de Londrina, Londrina, 86051-990, Brasil

Reprint requests to Dr. Wagner J. Barreto. Fax: 55-43-33714286. E-mail: barreto@londrina.net

Z. Naturforsch. 2007, 62b, 685–690; received December 18, 2006

Dedicated to Professor Oswaldo Sala on the occasion of his 80th birthday

A kinetic and spectroscopic study was performed on the substitution of Fe(III) by Ni(II) in the water soluble anion [Fe(L^1−)_2L^2−]−, a siderophore model (L^− = dopa-semiquinone and L^2− = dopa-catecholate). The reaction was followed in the UV/vis range through the appearing of an intense band at 592 nm due to the anion complex [Ni(L^1−)_3]− formed which also presents a resonance Raman effect. The overall reaction obeyed a zero-order rate law at 25, 35, 45, and 50 °C, and the rate constants and thermodynamic parameters have been obtained. A chemometric study based on the Imbrie Q-type factor analysis revealed that the reaction occurred with only one kind of intermediate whose UV/vis spectrum has been calculated.

Key words: Siderophore, Raman Resonance, Dopamine, Catecholamine, Iron