



POTENTIOMETRIC STUDY OF RHENIUM(V) COMPLEX FORMATION WITH AZATHIOPRINE AND CEFTRIAXONE

(Kajian Potentiometri Penghasilan Kompleks Rhenium(V) dengan Azatioprina dan Ceftriaxon)

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Abstract

The behavior of complex formation of Re(V) metal ion with azathioprine (AZ) and ceftriaxone (CE) as medicinal drugs has been investigated potentiometrically in 0.3 M hydrochloric acid. The stability constant of the prepared complexes has been determined and calculated at various temperatures. The obtained results showed that Re(V)-AZ system showed the formation 1:2, 1:3 and 1:4 complexes, while Re(V)-CE showed only 1:1 and 1:2 complexes. The complex formation suggests a successive displacement of the chloride molecules from the coordination sphere of the central ion by the AZ ligand. In addition, the effect of temperature on the complexes formation of Re(V) with AZ and CE was investigated. The entropy and enthalpy changes showed a favorable and exothermic process, respectively. The kinetic parameters of the formation complex process were calculated and discussed.

Keywords: rhenium(V), drugs, potentiometry, complex formation, stability constant

Abstrak

Tingkah laku penghasilan kompleks ion logam Re(V) dengan azatioprina (AZ) dan ceftriaxon (CE) sebagai ubat – ubatan telah dikaji secara potentiometri dalam 0.3 M asid hidroklorik. Pemalar kestabilan terhadap kompleks yang dihasilkan telah ditentukan dan dikira pada pelbagai tahap suhu. Hasil yang diperolehi menunjukkan bahawa sistem Re(V)-AZ mempamerkan penghasilan kompleks 1:2, 1:3 dan 1:4, sementara Re(V)-CE mempamerkan hanya kompleks 1:1 dan 1:2. Penghasilan kompleks mencadangkan satu anjakan molekul klorida berturut-turut dari lingkungan koordinasi ion tengah oleh ligan AZ. Di samping itu, kesan suhu pada pembentukan kompleks Re(V) dengan AZ dan CE telah dikaji. Perubahan entropi dan entalpi menunjukkan proses yang baik dan eksotermik. Parameter kinetik proses penghasilan kompleks turut dikira dan dibincangkan.

Kata kunci: rhenium(V), ubat, potentiometri, penghasilan kompleks, pemalar kestabilan

Introduction

The stability of complexes with medicinal drugs plays a major role in their biological and chemical activities. This is due to that, the medicinal drugs have various functional groups, which can bind to metal ions present in the human body [1, 2]. The azathioprine (AZ) is an immunosuppressive drug used in organ transplantation and autoimmune diseases [3 – 5] while the ceftriaxone (CE) is effective against a wide variety of Gram-positive and Gram-negative bacteria [6 – 9]. Very few works investigated the stability constant and thermodynamic parameters (ΔG , ΔH and ΔS) of Re-Az and Re-CE complexes at different temperatures. The complex formation behavior of AZ with various metal ions has been studied by the potentiometric titration method [10]. AZ is found to form 2:1