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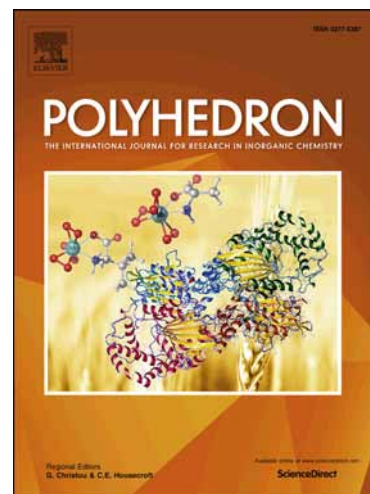
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Catalytic Aspects of a Nickel(II)-bipyridine Complex towards Phosphatase and Catechol Dioxygenase Activity

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Abstract

A mononuclear nickel(II) complex, $[\text{Ni}(\text{bpy})_2(\text{OH}_2)(\text{NO}_3)](\text{NO}_3)$ (**1**) [bpy = 2,2'-bipyridine], has been synthesized and structurally characterized by routine analytical techniques including a single crystal X-ray diffraction study. X-ray crystal structure analysis shows that **1** crystallises in the triclinic system with the $P\bar{1}$ space group and adopts an octahedral geometry. The nickel(II) complex has been evaluated as a functional model for phosphatase and catechol dioxygenase enzymes by using 4-nitrophenylphosphate (PNPP) and 3,5-di-tert-butylcatechol (DTBC) as model substrates in aqueous-DMF and acetonitrile media respectively. This mononuclear nickel complex exhibits good hydrolytic phosphoester cleavage efficiency, viz. a k_{cat} value of $8.42 \times 10^3 \text{ hour}^{-1}$, and produces mostly benzoquinone ($k_{\text{obs}} = 2.3 \times 10^{-3} \text{ min}^{-1}$) and intradiol cleavage products during an investigation of catechol dioxygenase activity.

Keywords: Nickel(II); Crystal structure; Phosphatase activity; Catechol dioxygenase activity;

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1. Introduction

In living systems, metalloenzymes with the capability of processing dioxygen under ambient conditions have attracted considerable interest from coordination chemists in recent decades [1-4]. Designed coordination molecules can effectively mimic the active sites of several bio-enzymes and lead to efficient, mild catalysts for carrying out different organic

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