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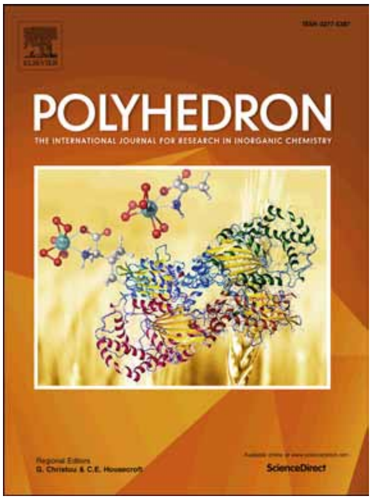

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Catalytic Aspects of a Nickel(II)-bipyridine Complex towards Phosphatase and Catechol Dioxygenase Activity

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Abstract

A mononuclear nickel(II) complex, $[Ni(bpy)_2(OH_2)(NO_3)](NO_3)$ (**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 8.42×10^3 $hour^{-1}$, and produces mostly benzoquinone ($k_{obs} = 2.3\times10^{-3}$ 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