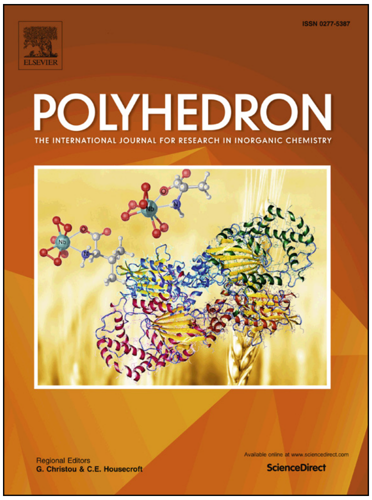

New di-μ-oxidovanadium(V) complexes with NNO donor Schiff bases: Synthesis, crystal structures and electrochemical studies

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New di-µ-oxidovanadium(V) complexes with NNO donor Schiff bases: Synthesis, crystal structures and electrochemical studies

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Abstract

The reaction between vanadyl sulfate and an NNO donor Schiff base (HL^1 or HL^2) in methanol resulted in the formation of two new binuclear vanadium(V) complexes, viz. $[(L^1)VO(\mu\text{-}O)_2VO(L^1)]0.5H_2O$ (**1**) and $[(L^2)VO(\mu\text{-}O)_2VO(L^2)]$ (**2**) (L^1 =*N*'-[(*E*)-phenyl(pyridin-2-yl)methylidene]benzohydrazide and L^2 = *N*'-[(*E*)-phenyl(pyridin-2-yl)methylidene]furan-2-carbohydrazide). During the reaction, atmospheric oxygen spontaneously acted as an oxidizing agent and yielded new ($V^{IV} \rightarrow V^{V}$) vanadium(V) complexes. The electronic spectra of **1** and **2** shown the vanadium(V) centre is in a distorted octahedral environment in each case. The complexes were characterized by routine physico-chemical methods. The single crystal X-ray structures of **1** and **2** also revealed a distorted octahedral coordination around each of the vanadium(V) centres, confirming the NNO binding mode of the ligands L^1 and L^2. In these binuclear complexes, the bridging functions are the µ-oxido bonds. The occurrence of weak CH.....π interactions in **1** and π........π stacking interactions in **2** contribute extra stabilization in their solid state. The complexes catalyzed the dismutation of superoxide in an alkaline nitroblue tetrazolium chloride assay and the IC_{50} values were estimated.

Keyword: vanadium(V) complexes, crystal structures, electrochemistry, CH......π interaction, π.......π stacking

1. Introduction

Vanadium is an essential trace element in animals and humans and it has been observed to relate to both glucose and lipid metabolism, and in turn to exhibit insulin-mimetic activity [1-4]. Its biological importance has been thoroughly investigated since it was first shown that vanadium had insulin mimetic activity in glucose metabolism [1,2]. Several workers have reported on the insulin mimetic activity of vanadate complexes in *vitro* and *vivo*. The insulin-enhancing activity of vanadium compounds have been extensively studied over the past few decades [5]. Vanadium has the ability to inhibit protein tyrosine phosphatise (PTPase) [6,7], stimulate glucose oxidation and transport in adipocytes and skeletal organs [8-10], enhance glycogen synthesis and inhibit gluconeogenesis in the liver [11,12]. Such clinical studies suggest the promising application for vanadium in the management of diabetes mellitus [13-15]. Insulin, a pancreatic signaling hormone, is the principal treatment for type 1 diabetes and is often required for type 2 diabetes as well. Insulin is not orally active and must be administered via intramuscular injection. Vanadium