Investigation of vanadium(III) and vanadium(IV) compounds supported by the linear diaminebis(phenolate) ligands : correlation between structures and magnetic properties.

Autorzy

Zofia Janas

Julia Jezierska

Andrew Ozarowski

Alina Bieńko

Tadeusz Lis

Adam Jezierski

Marta Krawczyk

Rok wydania

2021

Czasopismo

Dalton Transactions

Numer woluminu

50

Strony

5184-5196

DOI

10.1039/d0dt04302h

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

A family of oxidovanadium(IV) compounds containing linear diaminebis(phenolate (salans) L^{1-5} ligands (L^1 = $[MeNCH_2CH_2NMe(CH_2\text{-}4\text{-}CMe_2CH_2CMe_3\text{-}C_6H_3O)_2]^{2-}$; L^2 = $[MeNCH_2CH_2NMe(CH_2\text{-}4\text{-}CH_3\text{-}C_6H_3O)_2]^{2-}$; L^3 = $[MeNCH_2CH_2NMe(CH_2\text{-}4\text{-}Cl\text{-}C_6H_3O)_2]^{2-}$; L^4 = $\{MeNCH_2CH_2NMe[CH_2\text{-}4,6\text{-}(CH_3)_2\text{-}C_6H_2O]_2\}^{2-}$; and L^5 = $\{MeNCH_2CH_2NMe[CH_2\text{-}4,6\text{-}(Br)_2\text{-}C_6H_2O]_2\}^{2-}$) and non-oxidovanadium(III) with $L^{2,4}$ and acac ligands has been prepared and characterized by chemical and physical techniques. Reactions of $[VO(acac)_2]$ with ligand precursors $H_2L^{2,4}$ in toluene or hexane afforded vanadium(III) compounds $[V(L\text{-}\kappa^4ONNO)(acac)]$ (**1**, L^2; **2**, L^4), while the use of acetonitrile or ethanol led to the formation of dimeric oxidovanadium(IV) $[(VO)_2(\mu\text{-}L\text{-}\kappa^4ONNO)_2]$ (**3**, L^1; **4**, L^2; **5**, L^3) and monomeric $[VO(L\text{-}\kappa^4ONNO)]$ (**6**, L^4, **7**, L^5) compounds. As shown by X-ray crystallography, compounds **1** and **2** are monomeric, in which the chelating ligands afford octahedral *cis*-α geometry at the vanadium center. In the dimeric structures of **3–5**, the six-coordinate vanadium centers are bridged *via* two oxygen atoms of the L^{1-3} ligands while the $\mathbf{L^{4,5}}$ ligands generate square pyramidal structures of the monomeric **6** and **7** compounds. HFEPR studies allowed the determination of the spin Hamiltonian parameters of the $S = 1$ spin state of the monomeric V(III) and dimeric V(IV), and $S = ½$ in monomeric V(IV) compounds. Magnetic measurements of **3–5** indicated weak ferromagnetic metal–metal exchange interactions. A reaction course for the deoxygenation and reduction of vanadyl-salan compounds is proposed.

Adres publiczny

http://dx.doi.org/10.1039/d0dt04302h