Synthesis and structural and physicochemical characterization of {[Rh_2(μ-$OOCCH_3$)$_2$(dmbpy)$_2$][BF_4]}$_n$ molecular wire.

Autorzy

Magdalena Rak

Florian P. Pruchnik

Leszek Z. Ciunik

F. Lafolet

S. Chardon-Noblat

A. Deronzier

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Dinuclear Rh^{II} compounds [Rh_2(μ-$OOCCH_3$)$_2$(dmbpy)$_2$(H_2O)$_2$](CH_3COO)$_2$ (**1**) and [Rh_2(μ-$OOCCH_3$)$_2$(dmbpy)$_2$(H_2O)$_2$](BF_4)$_2$·2.5H_2O (**2**) (dmbpy = 4,4′-dimethyl-2,2′-bipyridine) were synthesized and characterized with spectroscopic methods. The structure of complex **2** was determined by using X-ray crystallography. The rhodium atoms in compound **2** have distorted octahedral coordination with O and N atoms in equatorial positions and a Rh atom and a H_2O molecule in axial coordination sites. Reduction of compound **2** with aqueous alcohols leads to the formation of the molecular wire {[Rh_2(μ-$OOCCH_3$)$_2$(dmbpy)$_2$][BF_4]}$_n$·2$n$$H_2O$ (**3**) containing a $[Rh_2]^{3+}$ core. Compound **3** shows strong antiferromagnetic properties, J = –780 cm^{-1} and μ = 0.128–1.349 B.M. in the range 1.8–300 K. The electrochemistry of compound **2** in acetonitrile was investigated. Complex **2** is irreversibly oxidized to a Rh^{III} compound at E_{pa} = 1.5 V and reduced to a wire with a $[Rh_2]^{6+}$ core at $E_{1/2}$ = –0.87 V showing the same properties as those of the product obtained during chemical reduction.

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