MAGNETIC AND ELECTRICAL FEATURES OF 1D AND 3D OXALATE-BRIDGED COORDINATION POLYMERS

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The design and synthesis of new materials with targeted physical properties represents an operative area of research for materials scientists. The combination of magnetic oxalate-based coordination polymers with organic/inorganic functional cations provides a suitable approach for designing hybrid magnetic materials exhibiting multifunctional properties. The oxalate moiety, $C_2O_4^{2-}$, acts as a linker between metal centers, with various possibilities of coordination to metal centers yielding open structures with dimensionalities ranging from 0 to 3. A property of oxalate ions that has been of specific interest is their ability to mediate electronic effects between paramagnetic metal ions. Proton conductivity is a new performance of the coordination polymers since they could provide required proton-conducting pathways, mostly by introducing (*i*) the guest molecules and counterions or acids into the voids, creating complicated hydrogen-bonded networks; (*ii*) other functional groups which can improve the acidity and hydrophilicity of the organic ligands and thus form an efficient proton transport pathway.

Three novel oxalate-bridged coordination polymers have been synthesized using $[Cr(C_2O_4)_3]^{3-}$ as building block: 1D homometallic $\{[Mn(bpy)(C_2O_4)]\cdot 1.5H_2O\}_n$ (**1**) (bpy = 2,2'-bipyridine) and heterodimetallic $\{[CrCu_3(bpy)_3(CH_3OH)(H_2O)(C_2O_4)_4][Cu(bpy)Cr(C_2O_4)_3]\cdot CH_2Cl_2\cdot CH_3OH\cdot H_2O\}_n$ (**2**), as well as 3D heterotrimetallic $\{[CaCr_2Cu_2(phen)_4(C_2O_4)_6]\cdot 4CH_3CN\cdot 2H_2O\}_n$ (**3**) (1,10-phenanthroline), and their structural diversity is reflected on magnetic and electrical properties which have been studied. The Mn-chains of **1** are antiferromagnetic; **2** shows the existence of antiferromagnetic oxalate-bridged Cu^{2+} dimers, which are independent from the oxalate-bridged Cu^{2+} and Cr^{3+} ions interacting ferromagnetically; **3** displays dimeric behavior, with Cu^{2+} and Cr^{3+} ions coupled ferromagnetically. Further, polymers **1** and **3** exhibit lower electrical conductivity at RT in comparison to compound **2**.[1]

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[1] L. Kanižaj, P. Šenjug, D. Pajić, L. Pavić, K. Molčanov, M. Jurić, *Materials* **2020**, *13*, 5341.