

Coordination Compounds of Fe³⁺, Co²⁺, Ni²⁺, Dy³⁺, and Gd³⁺ with (1-Amino-1-methyl-ethyl)phosphonic Acid and a New Schiff Base Ligand

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In the last decade, there has been a great interest in the phosphonic acid-based molecular complexes and coordination polymers. Because the M-O-P bonds are 1.5 times stronger than M-O-C bonds in carboxylates, phosphonates were used in the role of molecular precursors for the synthesis of new materials, such as polynuclear metal phosphonates, layered compounds, and porous metal-organic frameworks, with a wide range of properties and different applications. Phosphonate mononuclear complexes or molecular clusters with paramagnetic metal cations are very interesting objects because of their magnetic properties. We synthesized and isolated new molecular complexes and coordination polymers of AIPA ((1-amino-1-methyl-ethyl)phosphonic acid) and Na_xSAA, x = 1, 2 (sodium hydrogen (2-[[*E*-(2-hydroxyphenyl)methylidene]amino]propan-2-yl)phosphonate, disodium hydrogen (2-[[*E*-(2-oxidophenyl)methylidene]amino]propan-2-yl)phosphonate) ligands with Fe³⁺, Ni²⁺, Co²⁺, Dy³⁺, and Gd³⁺. Their properties were studied by a variety of physicochemical methods including structural analyses by single-crystal X-ray diffraction methods. Their magnetic properties were studied on a SQUID magnetometer. Among the most interesting results obtained in this study are isolation and characterization of hexanuclear iron(III) phosphonate Fe₆(NH₃(CH₃)₂CPO₃)₁₂(OH)₆·31H₂O, a 1D coordination polymer of Fe with the SAA ligand, a series of heptanuclear Co²⁺ phosphonates with a Star-of-David structural motif, and a coordination polymer of Ni²⁺ with SAA ligands. Beside that, mononuclear isostructural complexes of Ni²⁺ and Co²⁺ with AIPA were obtained and characterized. The presence of non-coordinated amino groups in the complexes with AIPA makes these compounds potential precursors for the synthesis of new extended structures.