Syntheses, Spectral and Thermal Studies, and Crystal Structure of 1,10-Phenanthroline and Picolinamide Complexes of Cobalt(II) Squarate

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Preparations, crystal structures, thermal properties, IR and UV/vis spectroscopic studies and magnetic moments of tris(1,10-phenanthroline)cobalt(II) squarate octahydrate, $[Co(phen)_3]sq \cdot 8H_2O$ (**1**) and diaquabis(picolinamide)cobalt(II) squarate, $[Co(H_2O)_2(pia)_2]sq$ (**2**) are described. **1** crystallizes in the monoclinic system, space group $P2_1/c$, with $a = 10.9832(5)$, $b = 21.4569(12)$, $c = 17.0649(7)$ Å, $\beta = 98.159(3)^\circ$ and $Z = 8$, while **2** crystallizes in the triclinic system, space group $P\bar{1}$, with $a = 6.9624(9)$, $b = 7.9224(11)$, $c = 8.0501(11)$ Å, $\alpha = 107.404^\circ$, $\beta = 93.340(11)^\circ$, $\gamma = 93.266^\circ$ and $Z = 1$. Both **1** and **2** have slightly distorted octahedral coordination geometry, involving six N atoms from bidentately chelating phen ligands and *trans*–$[CoN_2O_4]$ coordination geometry, in which the Co atom is located at a center of symmetry. There are significant hydrogen-bonding interactions in the structure of **1**. The squarate dianions are linked to the eight solvent water molecules by means of hydrogen-bonding interactions. Moreover, there are links between the complex cation and the squarate dianion *via* C–H···O hydrogen bonds. These interactions hold the crystal structure of **1** in a three-dimensional network, while O–H···O, N–H···O, weak $\pi\cdots\pi$ and $\pi\cdots$ring interactions lead to a three-dimensional crystal structure for **2**. The thermal decomposition pathways of **1** and **2** have been investigated by the help of thermal analyses data (TG and DTA).

Key words: Cobalt(II) Complex, 1,10-Phenanthroline, Picolinamide, Squarate, Thermal Decomposition