Synthesis, Crystal Structures, and Spectroscopic and Thermal Properties of New Cobalt Thiocyanato Coordination Compounds Based on 3-Methylpyridine as a Neutral Coligand

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Reaction of cobalt(II) thiocyanate with 3-methylpyridine in water leads to the formation of the new ligand-rich cobalt(II) thiocyanato coordination compounds [bis(thiocyanato-N)-tetrakis(3-methylpyridine-N)cobalt(II)] (1) and [bis(thiocyanato-N)-bis(3-methylpyridine-N)-diaqua-cobalt(II)] (2). The crystal structures of 1 and 2 consist of discrete complexes in which the cobalt(II) cations are coordinated by two terminally N-bonded thiocyanato anions and four or two terminally bonded coligands, respectively, in a slightly distorted octahedral geometry. Investigations on the thermal degradation behavior of 1 and 2 using simultaneous differential thermoanalysis and thermogravimetry as well as X-ray powder diffraction and IR spectroscopy have proven that on heating a stepwise decomposition takes place, which leads to the formation of the new phase-pure ligand-deficient intermediate [bis(thiocyanato-N)-bis(3-methylpyridine-N)cobalt(II)] (3). The crystal structure of 3 also consists of discrete complexes, but the cobalt(II) cations are only tetrahedrally coordinated by two terminally N-bonded thiocyanato anions and two terminally bonded coligands. The structures and the thermal properties are discussed and compared with that of related transition metal thiocyanato coordination compounds.

Key words: Coordination Chemistry, Cobalt(II) Thiocyanate, Crystal Structures, Thermochemistry