Synthesis, Topological Analysis and Properties of a Coordination Polymer with Butane-1,2,3,4-tetracarboxylato-bridged (Phenanthroline)cobalt(II) Units

Hong-Lin Zhu and Yue-Qing Zheng

State Key Laboratory Base of Novel Functional Materials & Preparation Science, Center of Applied Solid State Chemistry Research, Ningbo University, Ningbo, 315211, P. R. China

Reprint requests to Prof. Dr. Yue-Qing Zheng. Fax: Int. +574/87600747.
E-mail: zhengcm@nbu.edu.cn

Z. Naturforsch. 2011, 66b, 119 – 124; received October 27, 2010

A hydrothermal reaction of Co(Ac)2·4H2O, butane-1,2,3,4-tetracarboxylic acid (H4BTC), 1,10-phenanthroline (phen) and NaOH carried out at 160 °C yielded a new complex [Co2(H2O)2(phen)2(BTC)]. The complex has been characterized by single-crystal X-ray diffraction, IR spectroscopy, TG-DTA analyses, elemental analyses, powder X-ray diffraction, and magnetic measurements. The Co ions are linked by BTC4− anions into a chain, and hydrogen bonding and π-π stacking interactions result in the formation of a 3D (3,4,6)-connected supramolecular architecture with the Schlafli symbol (43.62.8)2(46.66.83)(63)2. The temperature dependence of the magnetic susceptibility of the compound follows a Curie-Weiss law \( \chi_m = C/(T - \Theta) \) with \( C = 4.18(4) \) cm3 mol\(^{-1}\) K and \( \Theta = -1.43(5) \) K, and the magnetic behavior can be interpreted by means of a 1D chain Fisher model, where the magnetic superexchange is transmitted via π···π stacking interactions between adjacent phen ligands, and the best fit results in \( J = -0.05 \) cm\(^{-1}\), and \( \sim J' = 0.21 \) cm\(^{-1}\).

Key words: Supramolecular Architecture, Butane-1,2,3,4-tetracarboxylic Acid, Crystal Structure, Topology, Magnetic Properties