

Synthesis of Methylammonium Hepta-Monomolybdate and Its Transformation by Heat-Treatment

Ndaru Candra Sukmana¹, Tatsuhiro Kojima², Masaru Fujibayashi¹,
Sadafumi Nishihara¹, Masahiro Sadakane¹

¹Hiroshima University, Higashi-Hiroshima, Hiroshima 739-8527, Japan

²Osaka University, Toyonaka, Osaka 560-0043, Japan

Abstract

The methylammonium hepta-monomolybdate $(\text{CH}_3\text{NH}_3)_8[\text{Mo}_7\text{O}_{24}\text{-MoO}_4]\cdot 4\text{H}_2\text{O}$ was synthesized by the evaporation of solution resulting from the reaction of MoO_3 and methylamine. The solid crystallizes in the space group P-1, which consists of $[\text{Mo}_7\text{O}_{24}]^{6-}$ anion, $[\text{MoO}_4]^{2-}$ anion, lattice water molecule, and methylammonium cation. The $[\text{Mo}_7\text{O}_{24}]^{6-}$ anion is built up of seven condensed edge-sharing MoO_6 octahedra. The crystal structure also contains co-crystallized monomolybdate $[\text{MoO}_4]^{2-}$ anion with tetrahedral geometry as shown in Figure 1. A similar structure containing $[\text{Mo}_7\text{O}_{24}]^{6-}$ and $[\text{MoO}_4]^{2-}$ with butan-1-ammonium (BuNH_3) counter cation was also reported earlier [1]. The transformation of methylammonium hepta-monomolybdate was investigated by thermal treatment in the air. Based on powder X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR), formation of various methylammonium isopolymolybdate such as $(\text{CH}_3\text{NH}_3)_8[\text{Mo}_{10}\text{O}_{34}]$ and $(\text{CH}_3\text{NH}_3)_4[\text{Mo}_8\text{O}_{26}]$, and molybdenum oxide such as hexagonal MoO_3 and orthorhombic MoO_3 were confirmed. The thermal transformation was similar to that of $(\text{NH}_4)_6[\text{Mo}_7\text{O}_{24}]\cdot 4\text{H}_2\text{O}$ [2].

Keywords: Polyoxometalates, Molybdenum

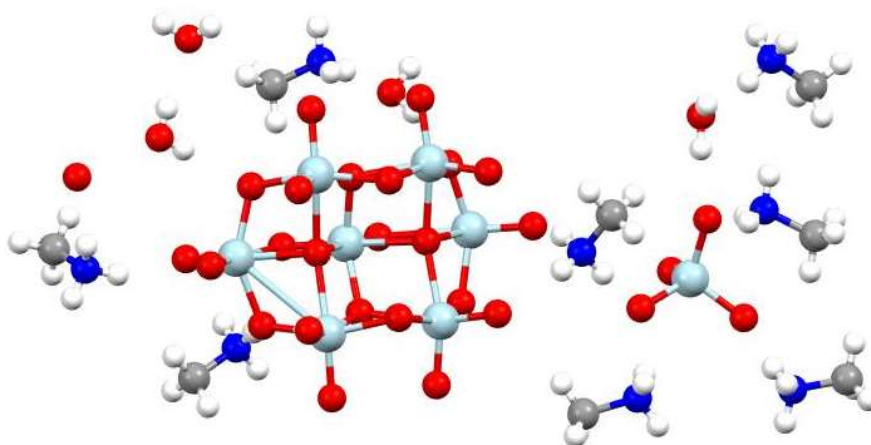


Figure 1. Structure of $(\text{CH}_3\text{NH}_3)_8[\text{Mo}_7\text{O}_{24}\text{-MoO}_4]\cdot 4\text{H}_2\text{O}$.
Mo, light blue; O, red; C, grey; N, blue

References:

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