

Structural, Spectroscopic Analysis and Photocatalytic Application of $K_2Co_2(MoO_4)_3$

R. Nasri^{a*}, T. Larbi^b, M. Amlouk^b, M. F. Zid^a

^aUniversité de Tunis El Manar, Laboratoire de Matériaux, Cristallographie et Thermodynamique Appliquée, Faculté des Sciences de Tunis, El Manar II, 2092, Tunis, Tunisia.

^bUnité de physique des dispositifs a semi-conducteurs, Faculté des Sciences de Tunis, El Manar II, 2092, Tunis, Tunisia.

e-mail: rawianasri11@gmail.com

In this contribution, potassium cobalt (II) molybdate $K_2Co_2(MoO_4)_3$ was synthesized by a solid-state reaction process. The morphology, the microstructure and the optical properties of prepared compound have been studied by means of scanning probe microscopy, X-ray diffraction (XRD), FTIR and Raman spectroscopy respectively. Also, this material was studied by photoluminescence (PL) and UV-vis spectroscopy. X-ray diffraction analyse reveal that $K_2Co_2(MoO_4)_3$ crystallizes in the monoclinic system with $P2_1/c$ space group and lattice parameters: $a=7.038(8)$ Å, $b=8.987(9)$ Å, $c=20.573(3)$ Å, $\beta=112.19(3)^\circ$, $V= 1204.9(7)$ Å³ and $Z=4$. This structure can be described by the presence of tetramers linked with each other by MoO_4 tetrahedra giving a three-dimensional crystal structure containing channels in which K^+ ions reside. Obtained Raman and IR lines were assigned to different normal vibration modes. The photoluminescence spectrum shows several peaks mainly associated with interstitials defects and oxygen vacancies due to a photoinduced charge carrier recombination. It is found that the rate of MB degradation is about 80% for Xenon and UV (8W) lights and it is of about 60% over sunlight during 2 hours. This work suggests a good photocatalytic activity of $K_2Co_2(MoO_4)_3$ which may be of interest to develop a safe, cost-effective solar water treatment process.