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PII: S0022-4596(16)30136-0  
DOI: <http://dx.doi.org/10.1016/j.jssc.2016.04.013>  
Reference: YJSSC19359

To appear in: *Journal of Solid State Chemistry*

Received date: 24 February 2016  
Revised date: 9 April 2016  
Accepted date: 11 April 2016

Cite this article as: Chang-Yu Meng, Ming-Fang Wei, Lei Geng, Pei-Qing Hu, Meng-Xia Yu and Wen-Dan Cheng, Synthesis, Structure, and Characterization of Two New Bismuth (III) Selenite/Tellurite Nitrates:  $[(\text{Bi}_3\text{O}_2)(\text{SeO}_3)_2](\text{NO}_3)$  and  $[\text{Bi}(\text{TeO}_3)](\text{NO}_3)$ , *Journal of Solid State Chemistry*, <http://dx.doi.org/10.1016/j.jssc.2016.04.013>

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# Synthesis, Structure, and Characterization of Two New Bismuth (III) Selenite/Tellurite Nitrates: $[(\text{Bi}_3\text{O}_2)(\text{SeO}_3)_2](\text{NO}_3)$ and $[\text{Bi}(\text{TeO}_3)](\text{NO}_3)$

Chang-Yu Meng,<sup>a</sup> Ming-Fang Wei,<sup>a</sup> Lei Geng,<sup>\*,b</sup> Pei-Qing Hu,<sup>a</sup> Meng-Xia Yu<sup>a</sup> and Wen-Dan Cheng<sup>c</sup>

<sup>a</sup>Department of Chemistry and Materials, Yulin Normal University, Yulin, Guangxi 537000, China

<sup>b</sup>Department of Materials Science and Engineering, Huaibei Normal University, Huaibei, Anhui 235000, China.

<sup>c</sup>State Key Laboratory of Structural Chemistry, Fujian Institute of Research on the Structure of Matter, Chinese Academy of Sciences, Fuzhou, Fujian 350002, China

\* To whom correspondence should be addressed. E-mail: lgeng.cn@gmail.com.

**Keywords:** Hydrothermal synthesis; Selenite nitrates; Tellurite nitrates; Crystal structure; Optical properties; Band structures

## Abstract

Two new bismuth(III) selenite/tellurite nitrates,  $[(\text{Bi}_3\text{O}_2)(\text{SeO}_3)_2](\text{NO}_3)$  and  $[\text{Bi}(\text{TeO}_3)](\text{NO}_3)$ , have been synthesized by conventional facile hydrothermal method at middle temperature 200 °C and characterized by single-crystal X-ray diffraction, powder diffraction, UV-vis-NIR optical absorption spectrum, infrared spectrum and thermal analysis. Both  $[(\text{Bi}_3\text{O}_2)(\text{SeO}_3)_2](\text{NO}_3)$  and  $[\text{Bi}(\text{TeO}_3)](\text{NO}_3)$  crystallize in the monoclinic centrosymmetric space group  $P2_1/c$  with  $a = 9.9403(4)$  Å,  $b = 9.6857(4)$  Å,  $c = 10.6864(5)$  Å,  $\beta = 93.1150(10)^\circ$  for  $[(\text{Bi}_3\text{O}_2)(\text{SeO}_3)_2](\text{NO}_3)$  and  $a = 8.1489(3)$  Å,  $b = 9.0663(4)$  Å,  $c = 7.4729(3)$  Å,  $\beta = 114.899(2)^\circ$  for  $[\text{Bi}(\text{TeO}_3)](\text{NO}_3)$ , respectively. The two compounds, whose structures are composed of three different asymmetric building units, exhibit two different types of structures. The structure of  $[(\text{Bi}_3\text{O}_2)(\text{SeO}_3)_2](\text{NO}_3)$  features a three-dimensional (3D) bismuth(III) selenite cationic tunnel structure  $[(\text{Bi}_3\text{O}_2)(\text{SeO}_3)_2]^\infty$  with  $\text{NO}_3^-$  anion group filling in the 1D tunnel along  $b$  axis. The structure of  $[\text{Bi}(\text{TeO}_3)](\text{NO}_3)$  features 2D bismuth(III) tellurite  $[\text{Bi}(\text{TeO}_3)_2]^\infty$  layers separated by  $\text{NO}_3^-$  anion groups. The results of optical diffuse-reflectance spectrum measurements

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