

Accepted Manuscript

Efficient inactivation of *Pseudomonas aeruginosa* by Cu/Co- α -NiMoO₄ in visible light

Schindra Kumar Ray, Dipesh Dhakal, Jae Kyung Sohng, Seung-Young Kim, Soo Wahn Lee

PII: S1385-8947(18)30695-8
DOI: <https://doi.org/10.1016/j.cej.2018.04.122>
Reference: CEJ 18922

To appear in: *Chemical Engineering Journal*

Received Date: 2 January 2018
Revised Date: 18 April 2018
Accepted Date: 19 April 2018

Please cite this article as: S.K. Ray, D. Dhakal, J.K. Sohng, S-Y. Kim, S.W. Lee, Efficient inactivation of *Pseudomonas aeruginosa* by Cu/Co- α -NiMoO₄ in visible light, *Chemical Engineering Journal* (2018), doi: <https://doi.org/10.1016/j.cej.2018.04.122>



This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Efficient inactivation of *Pseudomonas aeruginosa* by Cu/Co- α -NiMoO₄ in visible light

Schindra Kumar Ray^{a*}, Dipesh Dhakal^b, Jae Kyung Sohng^b, Seung-Young Kim^c, Soo Wahn Lee^{a*}

^aDepartment of Environmental and Bio-chemical Engineering, Sun Moon University, Chungnam, 31460, Republic of Korea.

^bDepartment of Life Science and Bio-chemical Engineering, Sun Moon University, Chungnam 31460, Republic of Korea.

^cDepartment of BT convergent Pharmaceutical Engineering, Sun Moon University, Chungnam 31460, Republic of Korea

*schindrakumarray@gmail.com and *swlee@sunmoon.ac.kr

Abstract

The Cu/Co- α -NiMoO₄ nanorods were fabricated by microwave hydrothermal process and characterized by various techniques. According to XRD/HRTEM/SAED/EDS analysis, the dopant ions were existed in the lattice of α -NiMoO₄. The Cu/Co- α -NiMoO₄ samples have capacity to inactivate the multidrug resistant *Pseudomonas aeruginosa* in visible light within 180 min. Also, they revealed the excellent stability with reusability. The scavengers test indicates that H₂O₂/OH[•]/O₂^{•-}/h⁺ play a crucial work for pathogen inactivation. Also, NBT assay suggested the enhancement of intracellular O₂^{•-} production in Cu (33 folds) and Co doped (29 folds) α -NiMoO₄. The FESEM analysis revealed dead bacteria cells by attack of active species on cell wall. Also, DNA fragmentation (gel electrophoresis) and protein degradation (Bradford assay) confirmed the inactivation of bacteria by active species. The evidence of superior biofilm penetration ability (69 %) by doped photocatalyst was exhibited by well plate based crystal violet assay and TEM/EDS mapping. The band gap reduction, surface plasmon resonance effect, oxygen vacancy, electron-hole trapping by Cu²⁺/Co²⁺/Co³⁺, formation of intermediate energy band, and efficient separation of electron-hole pair were contributed for enhancement of the pathogen inactivation in visible light by doping of Cu and Co in α -NiMoO₄. Also, Cu doped photocatalyst has slightly more pathogen inactivation efficacy than Co doped photocatalyst. The toxicity of photocatalyst was evaluated by using RAW 264.7 cells via MTT assay and the result revealed the toxicity. In conclusion, the Cu/Co- α -NiMoO₄ photocatalyst can be applied for efficient inactivation of multidrug resistant pathogen in biological waste water treatment.

Download English Version:

<https://daneshyari.com/en/article/6579072>

Download Persian Version:

<https://daneshyari.com/article/6579072>

[Daneshyari.com](https://daneshyari.com)