Facile synthesis of 2-dimensional CuO nanoleaves and their degradation behavior for eosin Y

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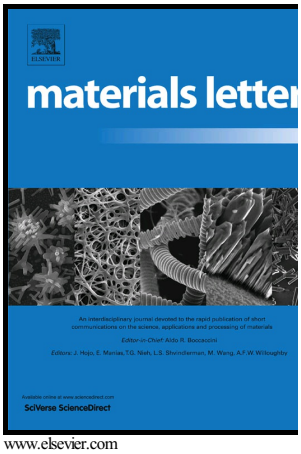

PII: S0167-577X(15)30420-1
DOI: http://dx.doi.org/10.1016/j.matlet.2015.08.064
Reference: MLBLUE19425

To appear in: *Materials Letters*

Received date: 12 June 2015
Revised date: 5 August 2015
Accepted date: 12 August 2015

Cite this article as: Archita Bhattacharjee and M. Ahmaruzzaman, Facile synthesis of 2-dimensional CuO nanoleaves and their degradation behavior for eosin Y, *Materials Letters,* http://dx.doi.org/10.1016/j.matlet.2015.08.064

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ABSTRACT

For the first time, 2D CuO nanoleaves (NLs) with average dimensions of ~350-450nm in length and ~60-90nm in width was successfully synthesized using NaOH and L-arginine. The as-obtained 2D CuO NLs were composed of CuO primary single crystal nanoparticles. The CuO NLs were characterized by XRD, TEM, SAED, FT-IR and UV analyses. A clear blue shift was observed in the band gap energy (~2.15eV) of synthesized CuO NLs. The prepared 2D CuO NLs act as an efficient and remarkable photocatalyst for the degradation of eosin Y by solar irradiation for the first time. The complete degradation takes place within 45 min.

Keywords: CuO-nanoleaves, nanoparticles, nanocrystalline materials, Eosin Y, X-ray techniques, Spectroscopy.

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1. INTRODUCTION

In recent years, semiconductor nanoparticles composed of nanorods, nanoleaves, nanowires, etc. have attracted a lot of interest. This is because of their potential applications in photocatalysis, gas sensors, electrodes and batteries. Among them, copper oxide (CuO), a p-type semiconductor, has been explored widely in photocatalysis, solar cells, sensors, batteries, field-emmiters, etc. [1-3]. This is because of the natural availability of starting material, low cost, stability, non-toxicity and high reactivity of CuO. The sizes and morphology of nanoparticles have a great impact on their physical and chemical properties. Therefore, many efforts were devoted for the fabrication of CuO nanostructures with different sizes and morphology to enhance their existing applications. Now-a-days, different CuO nanostructures, such as nonoribbons, nanorings, nanorods, nanobelts, nanowires, etc. have been synthesized [4]. Because of their potential applications, numerous methods were used to synthesize CuO nanostructures [1, 4-7]. Microwave methods are a promising route for the production of metal-oxide nanostructures. This method provides a more convenient, quite faster, energy saving and environmentally benign route for the synthesis of nanostructured metal oxides.

In this paper, we developed green synthesis of 2-dimensional CuO nanoleaves by microwave heating method using L-arginine. It was evident from the literature that size, morphology and properties of nanoparticles were modified because of the presence of amino acids. Hence, we design the synthesis using aminoacid, L-arginine so that nanoparticles with different morphology and