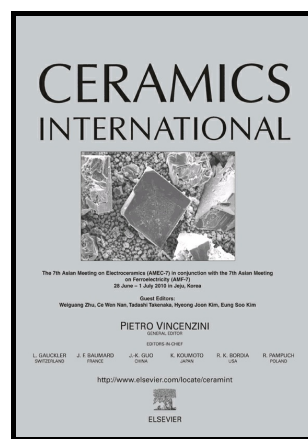


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Md Rakibuddin, Haekyoung Kim



PII: S0272-8842(18)31519-0
DOI: <https://doi.org/10.1016/j.ceramint.2018.06.088>
Reference: CERI18532

To appear in: *Ceramics International*

Received date: 30 April 2018
Revised date: 5 June 2018
Accepted date: 11 June 2018

Cite this article as: Md Rakibuddin and Haekyoung Kim, Synthesis and Characterization of facile industrially scalable and cost effective WO₃ micro-nanostructures for electrochromic devices and photocatalyst, *Ceramics International*, <https://doi.org/10.1016/j.ceramint.2018.06.088>

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Synthesis and Characterization of facile industrially scalable and cost effective WO₃ micro–nanostructures for electrochromic devices and photocatalyst

Md Rakibuddin, Haekyoung Kim*

School of Materials Science and Engineering, Yeungnam University, Republic of Korea

Abstract

A novel strategy for the synthesis of tungsten trioxide (WO₃) micro–nanostructures by thermal annealing of tungsten powder under ambient conditions is reported. The as-synthesized WO₃ samples are thoroughly characterized using powder X-ray diffraction, X-ray photoelectron spectroscopy, transmission electron microscopy (TEM), and Brunauer–Emmett–Teller (BET) measurement. The TEM results show that the size of highly crystalline WO₃ particles can be tuned from micro to nano by simply varying the annealing temperatures. The BET results demonstrate that the surface area and pore size of the synthesized WO₃ decreases with increasing annealing temperatures. Furthermore, the WO₃ synthesized at 550 °C (WO–550) exhibits not only higher surface area and pore size, but also excellent photocatalytic activity as well as super hydrophilicity compared to the other prepared and commercially available WO₃. However, among the synthesized WO₃ particles, only WO–550 exhibits moderate electrochromic properties. Our strategy is facile, cheap, rapid, and highly reproducible for large-scale production, and the use of toxic precursors or additional capping agents is also eliminated. We believe that the synthesis of WO₃ by our method could have various practical industrial applications, and yield an excellent alternative to commercial WO₃.

Keywords: Solid state synthesis, tungsten oxide, photocatalyst, electrochromic device, super-hydrophilicity

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