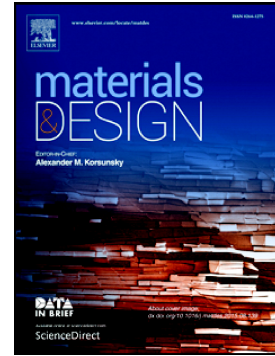


Accepted Manuscript

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PII: S0264-1275(18)30673-7
DOI: doi:[10.1016/j.matdes.2018.08.047](https://doi.org/10.1016/j.matdes.2018.08.047)
Reference: JMADE 7345
To appear in: *Materials & Design*
Received date: 22 May 2018
Revised date: 27 August 2018
Accepted date: 28 August 2018

Please cite this article as: Tao Long, Yin Xu, Xiaojian Lv, Jingwen Ran, Shuibin Yang, Lanying Xu, Fabrication of the annular photocatalytic reactor using large-sized freestanding titania-silica monolithic aerogel as the catalyst for degradation of glyphosate. *Jmade* (2018), doi:[10.1016/j.matdes.2018.08.047](https://doi.org/10.1016/j.matdes.2018.08.047)

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Fabrication of the annular photocatalytic reactor using large-sized freestanding titania-silica monolithic aerogel as the catalyst for degradation of glyphosate

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Abstract

A facile one pot method has been applied to fabricate large-sized freestanding titania-silica monolithic aerogels (TSMA). The obtained TSMA was characterized by scanning electron micrograph (SEM), Energy dispersive spectrometer (EDS), X-ray powder diffraction (XRD) and nitrogen adsorption measurements. SEM results show the TSMA has bicontinuous inner structure and large macropores (through-pores), which are favorable for the liquid infiltration. XRD results demonstrate the TSMA is anatase and nitrogen adsorption results reveal its high specific surface area of 445.9 m²/g. To maximize the catalytic activity of the as-prepared TSMA, an annular photocatalytic reactor has been specially designed and fabricated. With the apparatus, the as-prepared TSMA exhibited outstanding catalytic performance, which degraded glyphosate completely within 180 min of photocatalytic reaction. The kinetic rate (k value) of the photocatalytic reaction reaches 0.0242 min⁻¹. Ion chromatography results indicate that glyphosate was mainly mineralized to inorganic ions such as PO₄³⁻ and NO₃⁻, etc.

Keywords: Facile; Self-supporting; Photocatalytic reactor; Monolithic aerogels; Glyphosate

1. Introduction

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