

Accepted Manuscript

Title: Mechanochemical destruction of DDTs with Fe-Zn bimetal in a high-energy planetary ball mill

Authors: Hong Sui, Yuzhou Rong, Jing Song, Dongge Zhang, Haibo Li, Peng Wu, Yangyang Shen, Yujuan Huang



PII: S0304-3894(17)30617-9
DOI: <http://dx.doi.org/doi:10.1016/j.jhazmat.2017.08.025>
Reference: HAZMAT 18790

To appear in: *Journal of Hazardous Materials*

Received date: 1-6-2017
Revised date: 29-7-2017
Accepted date: 10-8-2017

Please cite this article as: Hong Sui, Yuzhou Rong, Jing Song, Dongge Zhang, Haibo Li, Peng Wu, Yangyang Shen, Yujuan Huang, Mechanochemical destruction of DDTs with Fe-Zn bimetal in a high-energy planetary ball mill, *Journal of Hazardous Materials* <http://dx.doi.org/10.1016/j.jhazmat.2017.08.025>

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.

Mechanochemical destruction of DDTs with Fe-Zn bimetal in a high-energy planetary ball mill

Hong Sui^{a, d, e}, Yuzhou Rong^{a, b, e}, Jing Song^{b, c, *}, Dongge Zhang^{a, b, e}, Haibo Li^{a, b, e}, Peng Wu^{a, b, e},
Yangyang Shen^b, Yujuan Huang^b

^a School of Chemical Engineering and Technology, Tianjin University, Tianjin 300072, China

^b Key Laboratory of Soil Environment and Pollution Remediation, Institute of Soil Science, Chinese Academy of Sciences, Nanjing 210008, China

^c University of Chinese Academy of Sciences, Beijing 100049, China

^d National Engineering Research Center for Distillation Technology (NERCDT), Tianjin 300072, China

^e Collaborative Innovation Center of Chemical Science and Engineering, Tianjin 300072, China

* Corresponding author. Tel.: +86 025 8688 1130. E-mail address: jingsong@issas.ac.cn (J. Song)

Research Highlights

- DDTs were efficiently destructed when grinding with Fe-Zn bimetal powder in a planetary ball mill.
- Mathematical relationships were established by the Discrete Element Method (DEM).
- The main driving force for destruction of DDTs was the normal impact energy.

ABSTRACT

Mechanochemical destruction has been proposed as a promising, non-combustion technology for the disposal of toxic, halogenated, organic pollutants. In the study presented, additives including Fe, Zn, Fe-Zn bimetal, CaO and Fe₂O₃ were tested for their effectiveness to remove DDTs by MC. The results showed that Fe-Zn bimetal was the most efficient additive, with 98% of DDTs removed after 4 hours. The Fe-Zn mass ratio was optimized to avoid possible spontaneous combustion of the ground sample during subsample collection. Inorganic water-soluble chloride in the ground sample increased by 91% after 4 hours of grinding, which indicated dechlorination during destruction of DDTs. In addition, relationships were established between the rate constant and the rotation speed or the charge ratio. Discrete Element Method (DEM) modeling was used to simulate the motion of the grinding ball and calculate both total impact energy and normal impact energy. The latter expressed a stronger, linear correlation with the rate constant.

Download English Version:

<https://daneshyari.com/en/article/4979076>

Download Persian Version:

<https://daneshyari.com/article/4979076>

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