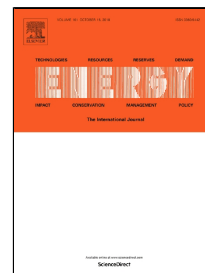


Accepted Manuscript

Pyrolysis of textile dyeing sludge in fluidized bed: characterization and analysis of pyrolysis products



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PII: S0360-5442(18)31866-8

DOI: 10.1016/j.energy.2018.09.102

Reference: EGY 13796

To appear in: *Energy*

Received Date: 23 June 2018

Accepted Date: 15 September 2018

Please cite this article as: Yang Liu, Chunmei Ran, Azka R. Siddiqui, Xiao Mao, Qin hao Kang, Jie Fu, Zeyu Deng, Yongmeng Song, Zhihui Jiang, Tianhao Zhang, Wenya Ao, Jianjun Dai, Pyrolysis of textile dyeing sludge in fluidized bed: characterization and analysis of pyrolysis products, *Energy* (2018), doi: 10.1016/j.energy.2018.09.102

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10

11 **Abstract:** Fluidized bed pyrolysis (FBP) of textile dyeing sludge (DS) was carried out
12 in a benchtop unit. The FBP char (FC) yield decreased and non-condensable gas yield
13 increased with increasing temperature. The minimum FC yield (73.47 wt%) and
14 maximum non-condensable gas yield (24.10 wt%) were found with addition of kaolin
15 at 850°C. The maximum condensates yield was observed at 650°C (i.e. 3.52 wt%)
16 without additives. Catalysts reduced condensate yield and promoted decomposition of
17 macromolecules (e.g. siloxane and dichloroacetic acid allyl ester). DS and FC contained
18 small amounts of heavy metals (e.g. Zn, Ni, Pb, Cr and Cu) and a better sulfur retention
19 ability of CaO at higher temperatures (e.g. 650-850°C) was observed. The surface
20 morphology of FC was improved significantly with increasing temperature and
21 catalysts addition. CO₂, CO and CH₄ yields in non-condensable gases increased with
22 temperature and the addition of CaO led to the highest yields of CO (5.46 wt%), H₂
23 (0.35 wt%) and CH₄ (1.22 wt%) at 850°C and the lowest yield of CO₂ (0.45 wt%) at
24 450°C. Higher temperature promoted release of nitrogen, sulfur and chlorine and
25 catalysts promoted release of nitrogen from DS. Kaolin and Ca-bentonite enhanced
26 release of sulfur, whereas CaO showed good sulfur retention capacity.
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28

29 **Keywords:** Textile dyeing sludge; Fluidized bed; Pyrolysis
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