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A process combining hydrothermal pretreatment, anaerobic digestion and pyrolysis for sewage sludge dewatering and co-production of biogas and biochar: Pilot-scale verification

Chunxing Li¹, Xingdong Wang¹, Guangyi Zhang², Jie Li¹, Zhiwei Li¹, Guangwei Yu¹,

Yin Wang^{1*}

¹ *Key Laboratory of Urban Pollutant Conversion, Institute of Urban Environment,*

Chinese Academy of Science, Xiamen 36102, China

² *State Key Laboratory of Multi-phase Complex Systems, Institute of Process*

Engineering, Chinese Academy of Sciences, Beijing 100190, China

Abstract: To fully dispose of/utilize sewage sludge, a process combining hydrothermal pretreatment (HTPT), anaerobic digestion (AD) and pyrolysis was developed and tested at the pilot scale. First, the improvement in sludge dewaterability by HTPT at 180 °C for 30 min was verified, and the water content decreased from 85 to 33 wt.% after filter pressing. Then, the resulting filtrate underwent continuous mesophilic (37 ± 2 °C) AD in an up-flow anaerobic sludge bed (UASB) reactor for producing biogas to compensate for the energy required for HTPT. Meanwhile, the filter cake was pyrolyzed in a rotary furnace (600 ± 50 °C) to generate biochar, and heavy metals were well immobilized in the biochar. Finally, the material/energy balance made according to the pilot data showed that the proposed process was effective for full

* Corresponding Author. Tel: +86 592 6190787; Fax: +86-592-6190787.
E-mail address: yinwang@iue.ac.cn (Y. Wang).

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