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Pyrolysis products from anaerobically digested and undigested sewage sludges

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Abstract

This study presents the first comparative assessment of the pyrolysis products from anaerobically digested and undigested sewage sludge in a continuous auger reactor. The samples were extensively analyzed using various methods to establish their characteristics. The product distribution has shown that the undigested sludge produced a higher liquid yield with significantly higher bio-oil content, compared to the counterpart sludge. On the other hand, the digested sludge produced higher non-condensable gas that is richer in hydrogen (21.2% against 9.6% in the undigested sludge). This is attributed to the relatively higher concentrations of Ca, Fe, Mg, Na, and Zn in the digested sludge biochar, which is known to act as catalyst for secondary reactions (e.g., tar cracking and gas reforming). The biochar, from both samples, was also found to be reasonably stable as per the European standards (O/C<0.4). The results of this study demonstrate the potential of sewage sludge pyrolysis in auger reactors and present strong evidence of the critical impact of the sludge treatment process on the pyrolysis yield and products quality.

Keywords: Pyrolysis, Bio-oil, Sewage sludge, Treatment, anaerobically digested sludge, Secondary sludge, Comparative assessment.

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