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Hydrothermal liquefaction of swine manure using sewage sludge as co-substrate to enhance pumpability for continuous processing

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Abstract

Hydrothermal liquefaction (HTL) is a promising technology for converting wet biomass like swine manure (SM) and sewage sludge (SS) into high energy bio-crude. Until now, one of the major problems associated with HTL is the pumpability of the feedstocks for continuous processing. In this context, this study presents a novel approach for the pumpability of the feedstocks SM:SS in ratios (1:0, 0:1, 1:1, 3:2, and 4:1) with 25% dry matter content. Obtained results showed that SM was not pumpable itself due to its fibrous nature, but became pumpable with the addition of SS. It was highlighted that almost 80% of the SM was smoothly able to pump with 20% SS.

After that HTL experiments were carried out of the samples SM:SS ((1:0, 0:1, 1:1, and 4:1) at 350 °C. The highest bio-crude yield with a synergistic effect was obtained at ratio 1:1 with a maximum HHV of 36 MJ/Kg. Almost 65% mass of all bio-crudes was formed from volatile components in the range of 350 °C. Aqueous phase analysis showed that SS samples contained a high nitrogen 17 g/l while SM carried a high amount of dissolved carbon 39 g/l. ICP-AES results revealed the majority of the inorganic elements were concentrated into the solid phase, while 10 to 20% potassium and sodium were transferred to the aqueous phase.

In conclusion, SM can be pumped by using SS as co-substrate to enhance the pumpability and improving the efficiency of the HTL system for continuous processing.

Biography:

Ayaz Ali Shah has been working as a researcher in the Advanced Biofuels group at the Department of Energy Technology, Aalborg University, Denmark. Ayaz Ali Shah has completed his Master of Engineering from the Mehran University of Engineering and Technology, Jamshoro, Pakistan, which is one of most leading research institutes in Pakistan. Ayaz Ali Shah has published a several high impact factor journal papers and many conference articles. His research area is focused on the optimization of the aqueous phase in HTL processing.

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