

Effect of Ultrasonic Pretreatment on Pyrolysis of Waste Water Sludge

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Abstract

Pyrolysis is one of the three main thermal routes, with gasification and combustion, for providing a useful and valuable bio-fuel. Thermal pyrolysis of waste sludge out of water treatment plant was carried out in a batch reactor made up of glass at temperature range of 300-450 C° , Nitrogen gas was used as sweep gas for maintaining oxygen-free atmosphere in the pyrolyser. The moisture content as seen from the proximate results increases in waste activated sludge after ultrasonic pre-treatment because the water is the media used in pre-treatment experiments .and the maximum fixed carbon recorded was 3.7% in oil sludge. Sulfur content in oil sludge was 1.418% which is higher than the other samples because oil sludge has oil fraction of hydrocarbons which contains sulfur compounds. As seen from the ultimate analysis the sulfur percentage decreases after ultrasonic pre-treatment. The effect of ultrasonic pre-treatment on pyrolysis of waste activated sludge (WAS) is studied to increase the liquid yields and the results show that using ultrasonic bath for both frequency of 50 and 30 kHz increases the liquid yield from 15.11 to 21.8 ,20.03% respectively ,and using ultrasonic probe for both frequency of 50 and 80 kHz increases the liquid yield to 20.32 and 22.88% respectively .. The thermal degradation temperatures of the raw materials are studied using thermo gravimetric analysis (TGA) at a heating rate of 10C°/min. The oil samples obtained under optimum condition was analyzed according to their fuel properties, PH, density and functional group presents.the comparision between pyrolysis and combustion of waste activated sludge ,primary sludge and oil sludge were studied by thermogravimetry ,The dynamic experiments were carried out at 10

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C°, and two different behaviours were observed at the decomposition curves. One of them shows combustion and pyrolysis curves that are parallel until high temperatures, and so the combustion process can be considered as an oxidative pyrolysis. The second behaviour shows combustion and pyrolysis curves that approximately coincide at low temperatures, but at high temperatures the combustion curve falls strongly, indicating that the combustion really occurs at high temperatures. The weight losses of WAS, primary sludge and oil sludge during pyrolysis were 25, 10, 45% respectively and the percentage increases in combustion to 40, 35, 70% respectively. The aim of the work was To study the Thermal Pyrolysis of sludge produced from wastewater treatment units. , comparison of the thermal pyrolysis products of sludge (waste activated sludge ,primary sludge ,sludge of oil refinery waste treatment unit) ,To study the effects of using the ultrasound on sludge pyrolysis as pretreatment steps and to study the Comparison between pyrolysis and combustion of waste water treatment sludge .