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Thermal Characteristics of Sewage Sludge to Develop an IDPG Technology

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Abstract : Sewage sludge is regarded as the residue produced by the waste water treatment process, during which liquids and solids are being separated. Thermal treatments are interesting techniques to stabilize the sewage sludge for disposal. Among the thermal treatments, pyrolysis and/or gasification has been being applied to the sewage sludge. The final goal of our NRF research is to develop a microwave In-line Drying-Pyrolysis-Gasification (IDPG) technology for the dewatered sewage sludge for the bio-waste to energy conversion. As a first step, the pyrolysis characteristics in a bench scale electric furnace was investigated at 800℃ for the dewatered sludge and dried sludge samples of which moisture contents are almost 80% and 0%, respectively. Main components of producer gas are hydrogen and carbon dioxide. Particularly, higher hydrogen for the dewatered sludge is shown as 75%. The hydrogen production for the dewatered sludge and dried sludge are 56% and 32%, respectively. However, the pyrolysis for the dried sludge produces higher carbon dioxide and other gases, while higher methane and carbon dioxide are given to 74% and 53%, respectively. Tar also generates during the pyrolysis process, showing lower value for case of the dewatered sludge. Gravimetric tar is 195 g/m3, and selected light tar like benzene, naphthalene, anthracene, pyrene are 9.4 g/m3, 2.1 g/m3, 0.5 g/m3, 0.3 g/m3, respectively. After the pyrolysis process, residual char for the dewatered sludge and dried sludge remain 1g and 1.3g, showing weight reduction rate of 93% and 57%, respectively. Through the results, this could be known that the dewatered sludge can be used to produce a clean hydrogen-rich gas fuel without the drying process. Therefore, the IDPG technology can be applied effectively to the energy conversion for dewater sludge waste without a drying pretreatment. Acknowledgment: This work was supported by the National Research Foundation of Korea(NRF) grant funded by the Korea government(MSIP) (No. 2015R1A2A2A03003044).

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