Co-pyrolysis of animal manure and waste plastic via TG-FTIR analysis

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Currently, there is an interest in using animal manure as an energy feedstock for energy production due to rising energy prices and growing concerns about the environmental risks associated with its overuse in agriculture.
The animal manure does not provide enough energy to sustain the pyrolysis process, therefore it seems interesting to look for other additives that positively influenced the efficiency of the pyrolysis process and the quality of its products. Therefore, studies on co-pyrolysis of animal waste with a small addition of plastic waste were carried out.
Co-processing of animal and plastic wastes via pyrolysis seems to be an interesting solution in aspects of a sustainable energy system. Joint use of animal waste and plastics can locally help to solve the problem of their disposal in an environmentally friendly using efficiently locally available resources.

In this paper co-pyrolysis of blends of cattle manure and plastic waste was investigated using micro-thermal analysis techniques. Thermogravimetry (TG-DTA) coupled with Fourier transform infrared spectroscopy (FTIR) were used to investigate the synergistic effects during the process on the thermochemical conversion and the pyrolysis product properties.
The pyrolysis of cattle manure/plastic waste blends in the proportions of (90:10%) and (80:20%) was performed at 10, 15 and 20 K/min heating rates under N_2 atmosphere.
The reaction regions, initial devolatilization and ended process temperatures and gas products were analyzed and compared to the results obtained in the pyrolysis of pure components.
Additionally, kinetic study of co-pyrolysis process which is useful for optimizing operation of the thermochemical conversion of the feedstock was studied. The changes of activation energy (E_α) are calculated using different model-free isoconversional methods: Friedman, Ozawa-Flynn-Wall and Kissinger-Akahira-Sunose.