Kinetic and Thermodynamic Studies on Co-Pyrolysis of Mahua Deoiled Seed Cake and Plastic Waste using thermogravimetric analysis

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INTRODUCTION

Solid waste generated by society is one of the major issues faced by municipal corporations of various cities in India. The earlier practice of land filling is no longer sustainable and becoming costlier with each passing day due to control of odours and recovery of by-products. The distribution of milk in cities is mainly done by using food grade LDPE. The low degradability is posing a big challenge in Municipal waste management. India is trying to produce valuable products such as biodiesel, bioethanol, solid briquette etc from biomass and bio wastes to meet the energy requirements of the economy. Solid biomass is slowly finding application in generation of heat and electricity. The energy can be obtained from various organic residues like industrial organic waste, municipal solid waste, agricultural residue etc. Co-pyrolysis of waste plastics with biomass has often shown synergetic effects and resulted in improved product quality. Plastics are generally rich in hydrogen and carbon and biomass in oxygen and thus supporting good quality and uniformity of products (due to decrease in coke deposition).Co pyrolysis of biomass and plastic often resulted in the decrease in Activation Energies with respect to waste plastics but higher than solid biomass.

SPECIMEN

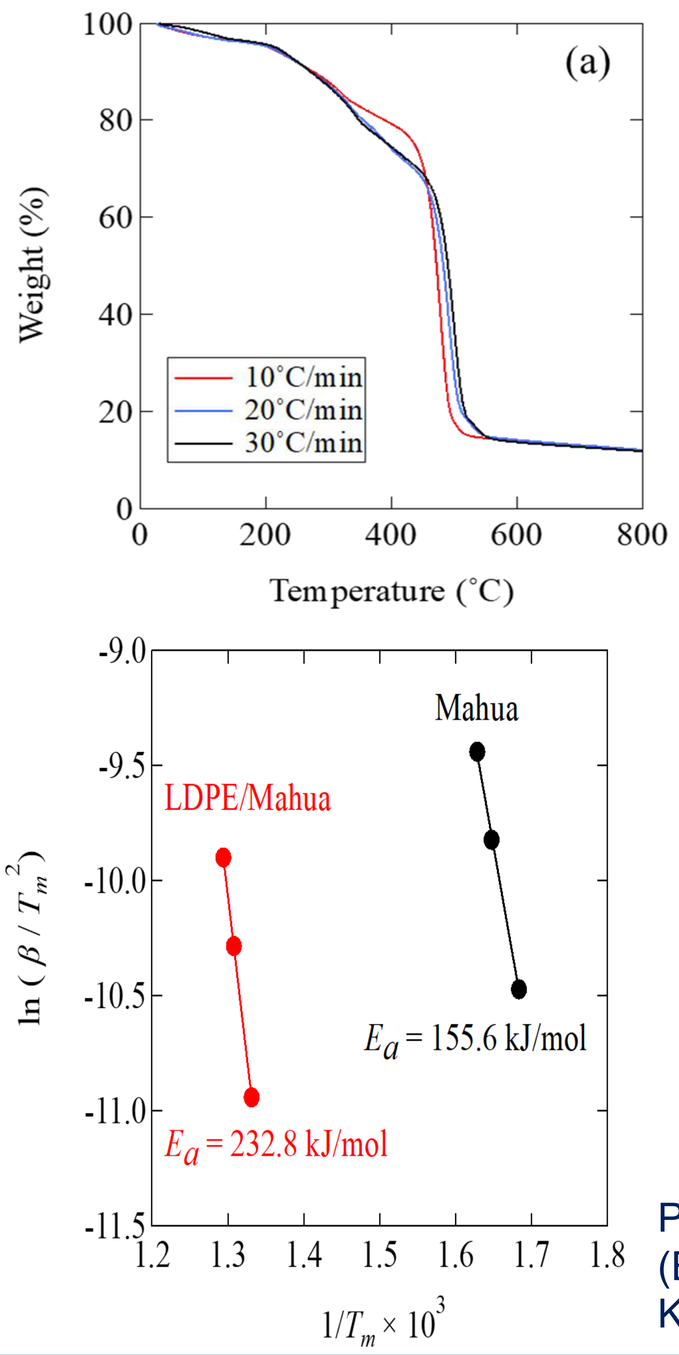
Mixture of MDC (Mahua Deoiled Cakes) and regenerated LDPE (Milk Packets from local Market) in the ratio of 1:1 (w/w)

METHODOLOGY

A binary mixture of MDC (Mahua Deoiled Cakes) and regenerated LDPE (Milk Packets from local Market) in the ratio of 1:1 (w/w) was used for studying the thermal decomposition behaviour during co-pyrolysis. The co-pyrolysis experiments were performed at three heating rates of 10, 20 and 30 ^{0}C/min in TG analyzer from room temperature to 800 ^{0}C. Model Free methods such as Kissinger, KAS (Kissinger-Akahira-Sunose) and OFW (Ozawa- Flynn-Wall) were used to determine the activation energy (E_a) for co-pyrolysis of Mahua Deoiled cakes and LDPE. The changes in parameters like Enthalpy, Gibbs free energy and Entropy were also determined.

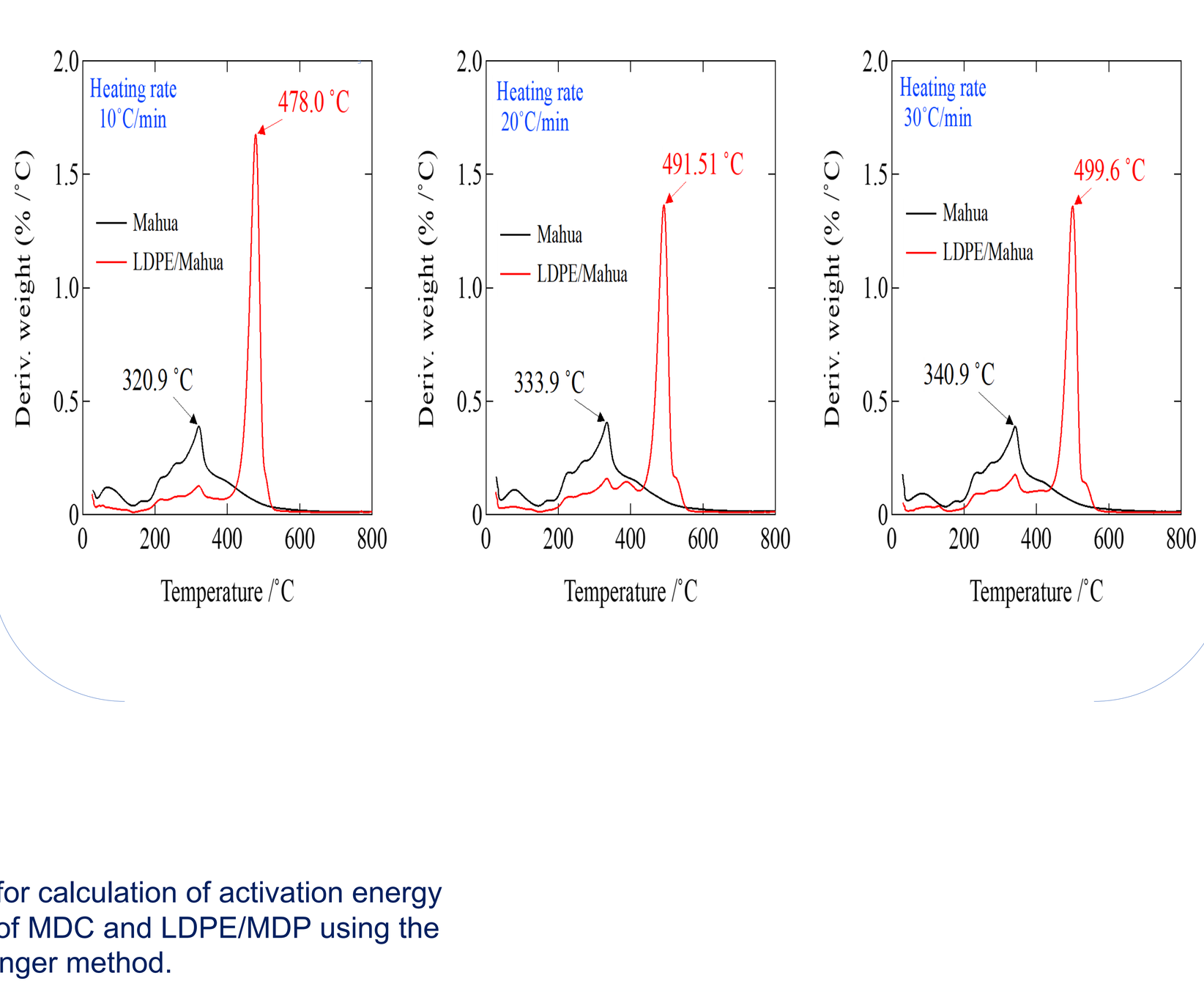
RESULTS AND DISCUSSION

TGA and DTG thermograms for co-pyrolysis of MDC/LDPE at heating rate 10, 20 and 20˚C/min.



Plot for calculation of activation energy (E_a) of MDC and LDPE/MDP using the Kissinger method.

DTG thermograms for co-pyrolysis of MDC/LDPE at heating rate 10, 20 and 20˚C/min.



CONCLUSION

The poster gives a brief overview on the need of co-pyrolysis of industrial (MDC) and municipal (LDPE) wastes and motives for carrying out the studies. The complete study contains the values of activation energy calculated by other methods such as KAS and OFW.

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