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Vivek Patil, Sushil Adhikari, Phillip Cross

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Co-pyrolysis of lignin and plastics using red clay as catalyst in a micro-pyrolyzer

Vivek Patil[a], Sushil Adhikari[a,b‡], Phillip Cross[a]

[a]Biosystems Engineering Department, Auburn University, 350 Mell Street, Auburn, Alabama 36849, United States

[b]Center for Bioenergy and Bioproducts, Auburn University, Auburn, Alabama 36849, United States

Abstract

In the current study, low-density polyethylene and polystyrene were co-pyrolyzed with dealkaline lignin in a micro-reactor at 500°C with and without low-cost red clay catalyst. The products were analyzed with GC-MS/FID to quantify phenolic compounds, alkanes and alkenes. The synergistic effect between plastics and lignin was studied by comparing the carbon yield of compounds from co-pyrolysis with that from individual pyrolysis. The co-pyrolysis of lignin and polystyrene was also performed at 600, 700 and 800°C to examine the effect of pyrolysis temperature. The study explores a novel approach to enhance lignin depolymerization with red clay catalyst while utilizing waste plastics.

Keywords: lignin; co-pyrolysis; plastics; red clay.

1. Introduction

Lignin, a major constituent of lignocellulosic biomass, can provide renewable fuels and chemicals when depolymerized via fast pyrolysis. However, high oxygen content of lignin leads to low quality of the inherently unstable bio-oil after fast pyrolysis (Karimi et al., 2014). Literature has reported high oxygen content and low hydrogen content of biomass components,

‡ Corresponding author. Tel: +1 334 844 3543; fax: +1 334 844 3530
Email address: sushil.adhikari@auburn.edu (S. Adhikari)