

COPYROLYSIS OF PLASTIC WASTE AND CATTLE MANURE TO FUEL OIL

INTRODUCTION

In this decade, plastic is used in many applications such as packaging, automotive, electronics, etc, since it has more advantage than other materials. The disadvantage of plastic material is that it is hardly degraded in environment. Thus, the amount of plastic waste is increasing rapidly, and plastic waste accumulation problem is generated. There are many ways to solve this problem but some methods have limitation. At this time, recycling method is a suitable solution to reduce these plastic wastes.

Recycling method is divided into four types. First, primary recycling is to recycle plastic scrap in the process. Secondary recycling is to remold plastic waste to lower grade product. Tertiary recycling is to convert plastic waste to feedstock. The last type is to use energy by plastic waste combustion. Tertiary recycling is a better way than other types of recycling for plastic waste reduction. Many researchers have been studying reaction to convert these plastic wastes back to feedstock since nineteenth century. Thermal, catalytic, and hydrocracking are well known reactions in conversion of these plastic wastes. Products which were obtained from each reaction are different, thus the reaction type can be chosen on the desired product.

Polyvinyl chloride (PVC) is a versatile plastic and ranked second behind polyethylene. It is mainly used in long-term application which the lifetime is between 20 and 40 years. Therefore, PVC is going to waste stream in this decade. Thermolysis of plastic waste has problem from PVC because when it is heated, it produces hydrogen chloride which corrodes the reactor during reaction. The method of hydrogen chloride reduction is studied in many ways such as metal oxide fixation, hydrothermal reaction and supercritical fluid technique. This research shows another method of hydrogen chloride reduction by using biological waste such as cattle manure to copyrolyze with PVC.

Objectives

1. To remove the hydrogen chloride gas from pyrolysis of PVC by cattle manure (a low-value substance).
2. To study kinetics of copyrolysis between PVC and cattle manure.
3. To investigate the appropriate catalyst for upgrading the copyrolyzed oil.

Scope of the Investigation

This research studies the efficiency of cattle manure in reacting with hydrogen chloride from pyrolysis of PVC. The effects of material ratio of PVC to cattle manure (1:1-1:5), reaction temperatures of 250–450°C, heating rates of 1-5°C/min and holding times of 0-60 min on hydrogen chloride removal were studied. The kinetic parameters of copyrolysis reaction were investigated by isothermal and dynamic methods. The last part of this research is the study of upgrading oil derived from copyrolysis of plastic waste and cattle manure using metal oxide-silica alumina composite catalysts.

Impact of Result

This research studies the new method of hydrogen chloride reduction in PVC pyrolysis process by utilizing waste from cow. The experimental data can be applied to municipal plastic waste treatment. Value is added to cow manure, and the pyrolysis equipment's life is prolonged.