

Deodorization of Tyre Oil using Mint Oil

Bhagyashri Shelke, Prof. Z.K. Deshmukh, Avinash Agwan

K.K.W.I.E.E.R, Nasik

ABSTRACT

The nature of tires makes them extremely challenging to recycle due to the available chemically cross-linked polymer and therefore, they are neither fusible nor soluble and consequently cannot be remolded into other shapes without serious degradation. The thermal decomposition of tires by pyrolysis produces char, gases and oil. The composition of oils derived from waste tires has common properties to commercial diesel fuel.

The problem associated with the light oil derived from pyrolysis of waste tires is that it has a high sulfur content and therefore emits harmful sulfur oxide (Sox) gases to the atmosphere when combusted in diesel engines. Desulfurization of TPO is necessary due to the increasing stringent environmental regulations worldwide.

This paper presents a low cost method for the purification of oils obtained from the pyrolysis of used tires. This method uses the mint oil for decrease the sulphur content from tyre oil. The experimental conditions were kept identical throughout. Some proportion of tyre oil are take and after desulphurization by using mint oil result deodorization of tyre oil.

KEYWORDS: *Pyrolysis, Desulphurization, Mint oil.*

HIGHLIGHTS:

- 1) Experimental investigation of Desulphurization of tire pyrolysis oils.
- 2) Comparison of various additives is carried out for purification of pyrolysis oils.

1. INTRODUCTION

The Unrecycled tire waste is an enormous global problem because of their non-biodegradability, their flammability and their chemical composition that leads to leaching of toxic substances into the ground on dumping and hazardous fumes on incineration. Since they are hefty, thick, and made of multiple materials, scrap tires present distinct challenges in recycling and disposal. Global production in 2008 was about 1.5 billion new tires. Around one billion of waste vehicle tires are accumulated each year. On the other hand disposal of waste tire from the automotive vehicle appear complex. Degrading of scrap tires in the nature is difficult for many years. There are studies and available literature on pyrolysis of waste vehicles tires. It is reported that pyrolysis oil of automobile tires contains 85.58% C, 12.30% H₂, 1.92% O₂, 0.88% S, and 0.44% N₂ components. Pyrolysis produces three principle products Oil, Gas, Char. The quantity and quality of these product depend upon temperature of reactor. In the pyrolysis process larger hydrocarbon chain break down at certain temperature in the absence of oxygen and gives end product usually contain solid, liquid, and gases.

This work will focus on the desulphurisation process and removal of odour with the help of mint oil.

2. EXPERIMENTAL WORK

Pyrolysis oil was collected from the one of the pyrolysis plant. Pyrolysis is the thermo chemical conversion process in which an irreversible chemical changes caused by the action of the heat in absence of the oxygen . The tyre pyrolysis oil obtain is a blackish liquid with the strong burned odour .The main physical and chemical properties ofpyrolytic oil is as follows.

Table 1. Physical and Chemical properties of pyrolysis oil

Sr.no	Test	Units	Results
1	Kinematic Viscosity	cSt	4.34@50C
2	Acid Value	Mg of KOH/gm	0.39
3	Flash point	C	26-28
4	Water content	% by wt	0.060
5	Pour Point	C	-13
6	Density @ 28°C	gm/cc	0.9701
7	Copper strip corrosion test for 3 hrs@100C	%	0.022
8	Gross Calorific Value	Cal/gm	10160 and above
9	Carbon residue	%by mass	0.1
10	Total sulphur	%by mass	2.16

3. DESULPHURIZATION

Heavy fuel oil usually contains of high amount of sulfur. Development a process for desulfurization of fuel oil is difficult as it contain heavy hydrocarbon and different impurities.Desulfurization is a chemical process for the removal of sulfur from a material. This involves either the removal of sulfur from a molecule (*e.g.* $A=S \rightarrow A:$) or the removal of sulfur compounds from a mixture such as oil refinery streams.

These processes are of great industrial and environmental importance as they provide the bulk of sulfur used in industry (Claus process and Contact process), sulfur-free compounds that could otherwise not be used in a great number of catalytic processes, and also reduce the release of harmful sulfur compounds into the environment, particularly sulfur dioxide (SO_2) which leads to acid rain.

4 .METHOD:

To remove the odor from pyrolysis oil here new method is used which remove the odor upto 70%- 80%. Desulfurization is one of the best method in which for 100 ml pyrolysis tyre oil take 10 ml of H_2SO_4 . Stir the whole mixture in continuous stirrer for about 120 min. also provide heat to the mixture at 50 C. after 2 hours let cool the mixture. Then kept it for sedimentation for 40 hrs.Then two layers of oil formed, upper layer contain oil reach phase whereas bottom layer contain carbon black and some amount of mercaptans. Take the upper layer which contain oil reach phase and add the 15ml of mint oil and stir it continuously.



Fig 1:Solution kept for sedimentation at room temperature for 40 hours



Fig 2: Desulfurization of pyrolysis oil

RESULT AND DISCUSSION

Odour in oil is formed due to the presence of sulfur compound (eg. Hydrogen sulfide, mercaptans, sulfides, Disulfides) and hydrocarbons. There are different methods are available in other literature to remove odour from pyrolysis oil but this method is having low cost and it feasible one to use. That is desulfurization of pyrolysis oil and use mint oil as aodor killer. Result in reduction of odor upto 60% to 70 %. This will definitely reduce the environmental impact by reducing amount of sulfur content in the oil.

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