How to Cite:
Mohammed, S. I., Hallow, T. A., & Mohammed, D. H. (2022). Improvement of octane number of Gasoline by using rubber waste. *International Journal of Health Sciences*, *6*(S6), 7290–7295. https://doi.org/10.53730/ijhs.v6nS6.12043

Improvement of octane number of Gasoline by using rubber waste

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Abstract---In this study, the octane number of gasoline was improved by using isobutanol isobutanol prepared in the treatment of tire inner rubber with kerosene at different temperatures and in different quantities, and then treated with concentrated capranic acid and water. Then, the formed alcohol and water are separated from the acid kerosene using fractional distillation, where the water and alcohol are separated, leaving the acid and kerosene, and then the distilled liquid (isertoy mixture) is heated on a column containing sodium tetramer. And mixed by 1, 1.5, 3, and 5% with gasoline, where the octane number was raised. Cassiochromatographic octane number assays were performed.

Keyword---inner tube rubber, sulfuric acid, kerosene, Gasoline.

Introduction

Scraped inner tube is the type of synthetic rubber is mostly used in automobile industry. It is a co. Polymer of 97-98 5 is butylene and 2-3% isoprene at low temperature via frieded crafts catalyst [1,2]. Millions of tubes are either thrown array or buried all over the world which is considered a threat of the ecosystem [3]. European tire and rubber manufacturers Association [ETRMA] statistics reported that 1400 million tires are being product, generating 17 million tons of used tire/ tube waste every year [4]. The scrap tires/tube due to their non-biodegradable nature repeatedly leads to black pollution [5]. rubber recovery can be difficult process [6]. Many academic attempts have been made for disposal of

rubber product. The various reclaiming method microwaving [7], milling [8] ultrasonic devulcanization [9] have been studied. On the other hand, octane number is a measure of the shock resistance of gasoline and engine oil. It is a standard measure of performance with a petrol engine or an aviation engine [10]. the empirical rule of octane number decreases with the number of CH_2 groups and increase with the number of CH_3 groups [11]. Octane number increase with the number of tertiary and quaternary carbon atoms resp. [12]. The iso paraffin index, ie the ratio of CH_3/CH_2 groups content was also found to be an important measure of octane number [13].

Experimental

The inner tube rubber used is this study was butyl from Qingdao supertrans industry, China. The rubber was cut into small pieces. Take 20 g of cut rubber in a conical flask and dissolve it in 100 ml of kerosene at different temperatures 90, 100, 110, 120, 130, 150 ° C and with different heating time also 3,3 ,3 ,4,4 and 5 hours and using a condenser to condense the rising steam during crushing process. The solubility obtained varies with the temperature and the time required for cracking. Then 10 ml of concentrated sulfuric acid, 15 ml of distilled water were added and reheated to 100 ° C for an hour. The sulfuric acid and kerosene were separated from the water and alcohol formed using fractional distillation at a temperature of 95 ° C, to form an isotropic mixture between the water and the alcohol formed, where the water was distilled with isobutanol. Temperature 235 ° C for the purpose of recycling and re-use. The isotropic mixture was taken and passed on a column containing a ketone tetramer, and then the isotropic mixture was frozen at a temperature of -10 ° C for the purpose of freezing the water and the isobutanol remained in the liquid state, thus it was separated from each other. 1, 1.5, 2.5 and 3.5 % of isobutanol were added to caseinol with octane number 90.3 in order to improve its octane number.

Results and Discussion

For the purpose of discussing the sequence of the practical part, the steps of the process were summarized as follows:

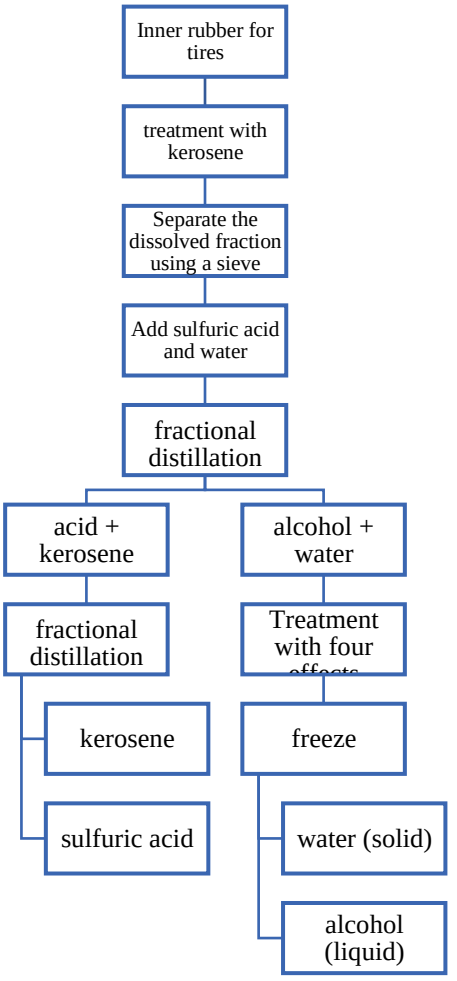


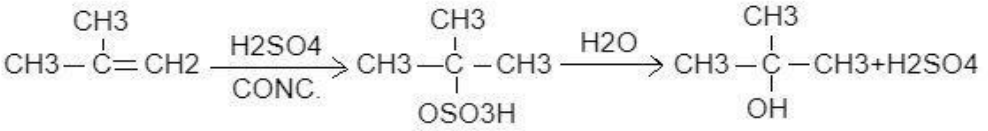
Figure 1. Shows the process of alcohol formation

The inner rubber of the tires was melted using kerosene in a ratio of 1: 5 (w/v) (1 rubber: kerosene) using high temperatures. different and at different times and the following table (1) shows the conditions used in each crushing process.

Table 1
Conditions of the thermal cracking process

No.	Rubber (gm)	Kerosene (ml)	Temperature C°	Time Hour	remaining after cracking (gm)
1	20	100	90	3	15
2	20	100	100	3	14
3	20	100	110	3	12
4	20	100	120	4	7
5	20	100	130	4	5
6	20	100	150	5	ND

From the above table it is clear that when the temperature increases, the amount of melted rubber increases By increasing the temperature and the time required for thawing, and it decreases to the highest percentage of dissolution set up at a temperature of 150 ° C, with a stirring time of 5 hours, by adding concentrated sulfuric acid and distilled water, which was added according to Marknikov's rule, followed by hydrolysis (Hydration) to form alcohol and acid [14].



Alcohol and water were isolated from acid and kerosene by using fractional distillation and passing the distilled liquid over a column containing cationic sodium (R-SO_3Na) for the purpose of getting rid of the effects of acid due to its gas effect on the engine, as well as on the separation columns used in gas chromatography devices. Then the liquid was frozen for the purpose of isolating the water from the alcohol, as the water freezes at 0°C, while the pionanol freezes at a temperature of -107°C. Figure (2) shows the fifth chromatogram with the standard isobutanol, as it was compared with the isobutanol formed from cracking after treatment. Figure (3) shows the fifth chromatogram with isobutanol formed after successive processes of treating rubber with kerosene at a temperature of 150 ° C and a time of 5 hours.

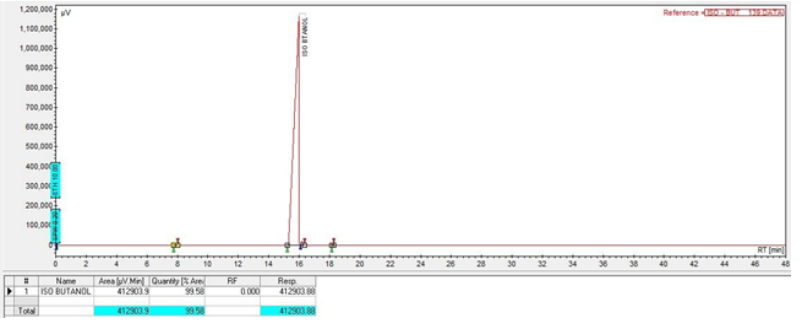


Figure 2. standard isobutanol

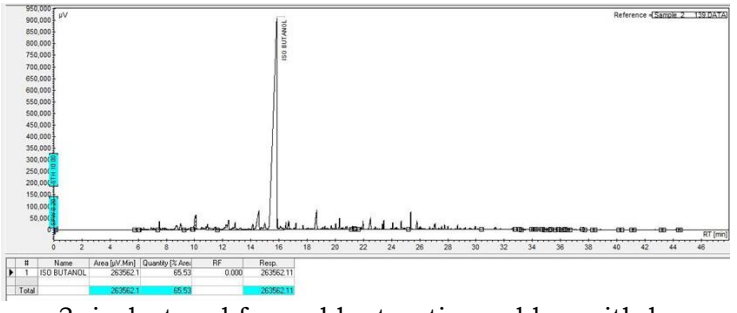


Figure 3. isobutanol formed by treating rubber with kerosene

The results of gas chromatography show that the percentage of isobutanol formed exceeds 60%, while the remaining percentage is compounds generated from isopropene, where the percentages of isobutane in tire rubber reach 3%.]2[. Table (2) below shows the amount of isobutanol added to casein with the octane number 90.3, as it turns out that the addition of 1% of isobutanol to casein led to an improvement in the octane number by approximately 2, which is the best percentage that can be chosen due to the economy of addition and the relatively large improvement in the octane number.

Table 2
Quantities of Isobutanol added to Caseolin to improve the octane number I

*	*Isobutanol added to Caseolin*	*RON	** MON	R+M/2
1	*0*	*90.3*	*83.0*	*86.6*
2	*1 %*	*92.1*	*83.3*	*87.7*
3	*1.5 %*	*92.9*	*83.4*	*88.2*
4	*2.5 %*	*93.7*	*83.6*	*88.7*
5	*3.5 %*	*94.5*	*83.9*	*89.2*

* ROM Research octane number
** MON Motor octane number

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