

The Mechanical Property of Plate Produce from Natural Rubber and Water Hyacinth

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ABSTRACT: At present, Water-Hyacinth expansion and breeding a large number of rivers in various regions of the many canals in Thailand. By the way Thailand is a leading manufacturer of natural rubber. This research fills the dried Water-Hyacinth particles to the Natural rubber product with dried Water-Hyacinth by 10, 20, 30, 40, and 50 phr (Parts per hundred rubbers). This research involves the study of mechanical properties of Plate Produce from Natural Rubber mixed with Water Hyacinth. Specimen size of 400*400*10 mm. Test result showed that Tension and elongation properties of the specimen decreased more than 50% when added more volume fraction of Water-Hyacinth to the mixture. Filling up the Water-Hyacinth by particle (3-5 millimeters) at volume fraction at 10-50 phr (Parts per hundred rubbers) give rise to increasing the hardness property, compression set but decreased tensile and thermal conductivity being comparable with pure Natural rubber.

Keywords: Natural Rubber, Water-Hyacinth, Mechanical Property, Thermal Conductivity

1. INTRODUCTION

Thailand is one of the major agricultural countries in the world. More than 50 percent of the population works in agriculture. With the optimize geography and climate. Plants can grow very well. And on the other side unwanted weeds can grow as well too. It causes environmental problems from weeds and inappropriate weeds. History of the fiber plants study. It is found that these materials are structurally composed of three major organic chemicals, namely cellulose, hemicellulose, and lignin. Especially the cellulose content is up to 60-80% of all compounds. Water Hyacinth is a weed that can breed quickly. It becomes a serious weed in a common water source. This is so damaging to waterways. Including a large volume of it makes it difficult to live a normal life of the villagers near the water source. By the problem of Water Hyacinth it is a national problem at present. The government attaches great importance. Currently, synthetic rubber (SR) made from oil input may not be perfectly substitutable for natural rubber (NR). However, the large drop in oil price during 2005-2011 has resulted in a substantial decline in the price of SR. In addition, China – the world's major producer – has been developing a technology such that synthetic rubber can increasingly replace natural rubber in the production of car tire, especially for the passenger cars which occupy a dominant (75%) and growing share in the global automobile market. This causes a significant structural change in the global rubber industry; most evidently, the consumption of SR has expanded constantly in the last 10 years and currently stands at 60% of total rubber consumption [1]. Otherwise, government of Thailand is promotion of rubber planting by an additional 1 million rai, bringing about an increasing volume of new rubber supply into the market during 2012-2015. Thailand is a country that can produce a lot

of natural rubber and cheap. In 2015, Thailand was the world's no.1 rubber producer with 4.5 million tons of output or 35.7% of total production, followed by Indonesia, China, India, and Malaysia with the shares of 26%, 7%, 6%, and 5.5%, respectively. In recent years, global natural rubber (NR) industry has encountered significant pressure from a continued drop in prices. The natural rubber is useful to be processed, improve the mechanical properties like elastic modulus or resistance to abrasion. Be more active in the development and development of more environmentally friendly products. The researcher team wants to produce environmentally friendly materials using the weed fiber materials mixed with natural rubber latex.

2. EXPERIMENTAL

1. Preparation of fiber Water Hyacinth and Natural Rubber materials.

Use Water Hyacinth fiber with a fiber diameter 3-5 mm, mixed with Natural rubber latex. By the way of mixing with 0.5 phr of Sulphur, 1 phr of Zinc Oxide and 2.5 phr of Accelerator TMTD were shown in Table 1. All materials were mixed in the mechanics chamber to nearly be Homogeneous Mixtures. Some of information about the materials was shown in Fig.1

2. Product Formulation

Hot pressing method is a very important step in the production process. It is a compressed press (Platen presses) in the horizontal line of the mixture with top and bottom pads and steel plate thickness control. A set of hydraulic compressors used as a compression machine for forming the product. The thickness used in the production is 10 mm, the compression time is 20 minutes, and the temperature is 100 degrees Celsius.

3. Preparation of specimens for physical and mechanical testing follows the JIS 5908-2003

Table 1 Materials and processes

NR:Water Hyacinth (phr)	Sulphur (phr)	Zinc Oxide (phr)	Accelerator TMTD (phr)	Vulcanize Temperatures (°C)	Vulcanize Times (minute)
100:10	0.5	1	2.5	100	20
100:20	0.5	1	2.5	100	20
100:30	0.5	1	2.5	100	20
100:40	0.5	1	2.5	100	20
100:50	0.5	1	2.5	100	20

Step of preparation of Water Hyacinth fiber are cuttings will be cut off the roots of the plants, leave and boiled in Sodium hydroxide for 1 hour.



Fig. 1 Water Hyacinth (a), Dried Water Hyacinth Fiber(b), Natural Rubber latex (c)

3. RESULT AND DISCUSSION

This research investigated the physical, mechanical and thermal properties of the Natural Rubber and Water Hyacinth fiber mixtures, such as tensile strength, compression set and thermal conductivity test. The results were shown the following diagram in Fig.2 - Fig.4.

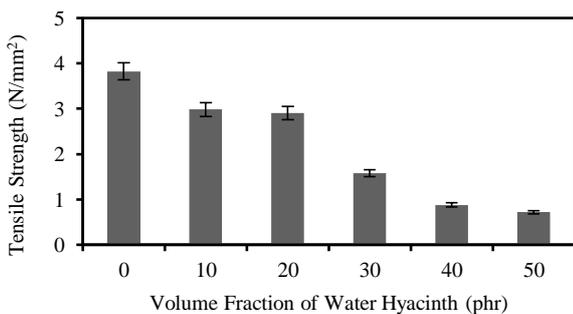


Fig.2 Tensile strength of Natural Rubber and Water Hyacinth mixture

From Fig.2 it was found that the result of testing had relatively low tensile strength but when the volume fraction of Water Hyacinth fiber increased. Tensile

strength is likely to decrease respectively. At pure natural rubber plate has nearly 4 N/mm² got down to 50% at 30 phr of fiber and lower than 1 N/mm² at 40 and 50 phr of Water Hyacinth fiber

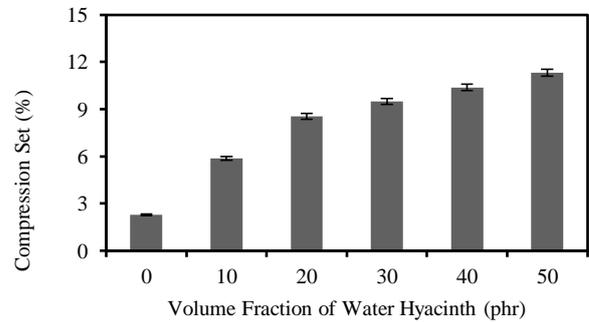


Fig.3 Compression set property of Natural Rubber and Water Hyacinth mixture

From Fig.3 it was found that the result of Compression set testing had low compression set property of pure Natural Rubber and got higher after increase added the volume fraction of Water Hyacinth fiber in the mixture. The volume fraction of Water Hyacinth fiber increased, compression set property increase respectively.

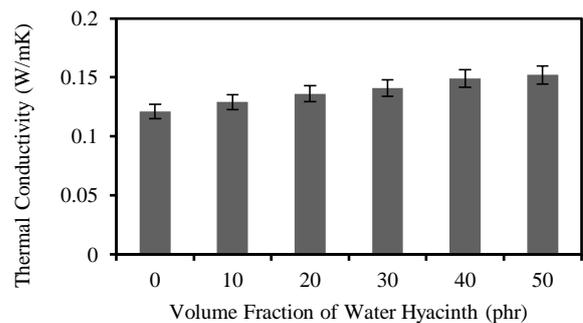


Fig.4 Thermal property of Natural Rubber and Water Hyacinth mixture



Fig.5 Specimen for thermal property testing of Natural Rubber and Water Hyacinth mixture

From Fig.4 it was found that the result of Thermal property testing had low thermal property of pure Natural Rubber and got higher after increase added the volume fraction of Water Hyacinth fiber in the mixture. It means that insulation of the product was decrease when added more fiber to the mixture. The

volume fraction of Water Hyacinth fiber increased, Thermal property increase respectively.

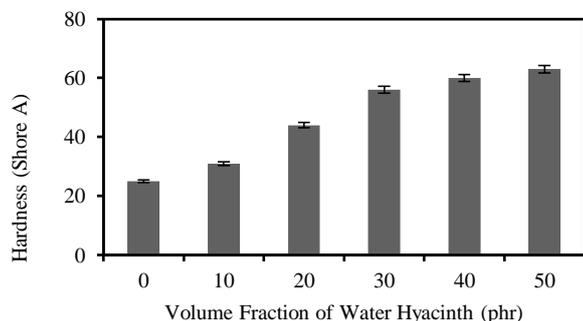


Fig.6 Hardness property of Natural Rubber and Water Hyacinth mixture

From Fig.6 it was found that the result of hardness property testing had low hardness property of pure Natural Rubber and got higher after increase added the volume fraction of Water Hyacinth fiber in the mixture. It means that hardness of the product was increase when added more fiber to the mixture. The volume fraction of Water Hyacinth fiber increased, hardness property increase respectively.

4. CONCLUSION

1) Increasing the amount of water hyacinth filler in natural rubber. Increase the hardness of the specimen. It indicates that water hyacinth fillers act as a reinforce filler and increase the volume of rubber products.

2) Physical properties of natural rubber with 50 phr of water hyacinth filler compared with pure natural rubber is higher than pure.

3) As an alternative to unwanted rubber, mechanical strength is another major property, such as rubber flooring, chair legs support and equipment to help in packing product, etc.

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