Preliminary Study of Banana Skin Powder as Filler of Natural Rubber Latex Films by Dipping Method

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Abstract

The use of banana skin as a filler for NR latex has been done by dipping technique. The banana skin going to be used as a filler was previously powdered and further processed into a dispersion system. Scanning electron microscope (SEM) of the produced banana skin powder has also been performed. Product of NR latex films was produced by dry dipping method, in which a former was previously cleaned. Later the former was dipped into latex containing mixture of curatives and filler of dispersion of banana skin powder. The film was dried at vulcanized temperature at 100 °C and 150 °C. Produce obtained was investigated to prove that the banana skin powder of the NR latex film.

Keywords ; NR latex, banana skin powder, mechanical properties.

1. INTRODUCTION

Addition of filler into a NR latex compound is generally meant to reinforce the vulcanized of a rubber, so that stiffness, tensile strength and other mechanical properties including resistances to abrasion and tearing would improve. Based on strength effects on the rubber properties, fillers can be categorized into 3 groups (Boonstra, 1973) : reinforcing filler, semi reinforcing filler and non reinforcing filler. Reinforcing filler is used to improve the mechanical properties of rubber vulcanized as described above. Each type of filler results in certain properties of rubber as a consequence of its specific chemical surface. Filler can be mineral and non mineral compounds.

Except its fruits, other parts of the banana plant such as its stem, roots, skin and flower have rarely been used. As the science and technology are continue to develop, many efforts could be done to make use of wastes which in turn their qualities and value added will be improved but also create friendly environment (http://bemteunnes.wordpress.com/2008/04/23/variabel/ diakses 13/02/2009) It is hoped that filler produced from the banana skin contains carbohydrates, little bit proteins will increase the properties of NR latex films.
2. METHOD AND MATERIALS

Films prepared by dipping cleaned formers into prevulcanized latex compound. The prevulcanized latex compound was prepared by compounding the ingredients shown in Table 1 in a reaction flask at 70 ± 1 °C. After that the film were dried at 100 °C and 150 °C and tensile test was done on the dried films.

Table 1. Formulations for latex prevulcanization

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Amount (phr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>62.05% latex</td>
<td>100</td>
</tr>
<tr>
<td>10% KOH</td>
<td>0.50</td>
</tr>
<tr>
<td>50% Sulphur</td>
<td>1.50</td>
</tr>
<tr>
<td>30% ZnO</td>
<td>0.25</td>
</tr>
<tr>
<td>50% ZDEC</td>
<td>1.50</td>
</tr>
<tr>
<td>50% AO 2246</td>
<td>1.00</td>
</tr>
<tr>
<td>20% Banana skin powder</td>
<td>5</td>
</tr>
</tbody>
</table>

2.1 Measurement of Tensile Properties

Tensile tests were carried out according to ASTM D-412 on an Instron machine model 3366, 0.11-0.19 mm thick dumbbell specimens were cut from the mould sheets with a Wallace die cutter. A cross head speed of 500 mm/min was used and the test was performed at 25 ± 3 °C. From the test the following were evaluated: tensile strength, M100, M300 and elongation at break.

2.2 Morphology Study

Studies on the morphology of the tensile and surfaces of the films were carried out using a scanning electron microscope (SEM), model Leica Cambridge S-360. The fracture ends of specimens were mounted on aluminum stubs and sputter coated with a thin layer of gold to avoid electrostatic charging during examination.

RESULTS AND DISCUSSIONS

Figure 1 shows that tensile strength of the films decreases, and as the vulcanization time is increased the tensile strength will also decrease. The same situation will be obtained if the vulcanization temperature is increased then the tensile strength will decrease. Tensile strength of the films are still within the standard value of the NR latex product, therefore it is feasible to be used.
The influence of the banana skin on modulus of the NR latex films can be seen in figure 2 and 3. Modulus refers to the strength required to support a material (Morton, 1973). At figure 2 is shown that M100 decreases when the temperature and drying time are increased. High temperature probably results in a decrease in the support capability of the rubber material. M300 shows a slight difference in the material property. M300 increased as the temperature was increase if vulcanization time was longer. Increase in the value of M300 was caused by cross-link to support the material. When value of cross-link density increased then relaxation of modulus would also increase (Morton, 1973). As the vulcanization time was increased, M300 would decrease. A long vulcanized time have resulted in compound degradation.

![Figure 2 Effect of banana skin powder as filler on M109 of NR latex films](image)

![Figure 4 Effect of banana skin powder as filler on elongation at break of NR latex films](image)
Figure 5 shown particles of banana skin powder using emission scanning electron microscope with magnification 50 times.

![Image](image_url)

Figure 5 Scanning electron micrographs of banana skin powder run 1 and run 2

3. CONCLUSIONS

Powder of banana skin has potency to be made use as a filler for the NR rubber products since it does not destroy the properties of the NR rubber films.

4. REFERENCES


