Walaiporn Rungjang 2013: Bacterial Cellulose Filled Natural Rubber Composites. Master of Science (Biotechnology), Major Field: Biotechnology, Department of Biotechnology. Thesis Advisors: Mr. Prakit Sukyai, Dr.nat.techn. 70 pages.

Bacterial cellulose (BC) produced by the *Glucanacetobacter xylinus* and the BC powder was produced from dried BC by mechanical process. The particle size of BC powder was in approximately 180 μm. It was used as reinforcing element in natural rubber matrix and a source of bacterial cellulose nanowhiskers (BCNWs) extraction. BCNWs were produced from BC using sulfuric acid hydrolysis. The average length (L) and diameter (D) of BCNWs were 186 nm and 7 nm, respectively, giving an aspect ratio (L/D) around 28. The BCNWs were used as reinforcing phase to nanocomposites films using latex of natural rubber as matrix. Natural rubber (NR) reinforce BC composites were prepared on a laboratory two-roll mill. The influences of BC concentration on the cure characteristics, mechanical and thermal properties of the rubber composites were investigated. The scorch time decreased with an increase in cellulose loading, but there was no appreciable change in cure time. A significant improvement of modulus and hardness was observed as a result of the addition of BC to the NR matrix, especially at high cellulose loading, while the tensile strength and elongation at break of natural rubber composites decreased with increasing BC filler loading. Differential scanning calorimetry (DSC) and dynamic mechanical analysis (DMA) results showed no change in the glass transition temperature (Tg) of the rubber matrix with the addition of BC, but there was a softening of rubber. DMA showed the stiffness and rigidity of composites. Scanning electron microscopy (SEM) revealed the morphology of bacterial cellulose and the interaction between matrix and cellulose. The effect of BCNWs loading on tensile and thermal properties was investigated. Both tensile strength and modulus showed improved stiffness for bacterial cellulose nanowhiskers/natural rubber (BCNWs/NR) nanocomposites at 7.5% BCNWs loading. On the other hand, elongation at break of BCNWs/NR nanocomposites was decreased with increasing BCNWs filler loading. Differential scanning calorimetry results exhibited no change in Tg. The thermogravimetric analysis indicated that no significant effect of the BCNWs on degradation temperature of NR whereas the onset temperature was slightly changed.

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