STUDY ON THE EFFECT OF FILLER COMBINATIONS TO THE COST AND QUALITY OF AN INDUSTRIAL NITRILE GLOVE

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Master of Science in Polymer Science & Technology

DECLARATION

I hereby declare that this research project was conducted by me, under supervision of Dr. Rajitha Gunarathne, Visiting Lecturer, Department of Chemistry, University of Sri Jayewardenepura, Sri Lanka and Prof. Sudantha Liyanage, Dean, Department of Chemistry, University of Sri Jayewardenepura, Sri Lanka. I also certify that this thesis has not been submitted in whole or in part to any University or any other institute for another Degree / Diploma.

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ABSTRACT

Carboxylated acrylonitrile butadiene (XNBR) is vastly used synthetic latex for industrial glove applications. In this project main intention was to make defects free, cost competitive industrial glove with enhanced mechanical properties with the use of XNBR latex compound and fillers. Hence three types of fillers and then their combinations were incorporated into XNBR compound which contained XNBR latex and other required curatives, to find out most suitable filler or filler combinations for the XNBR latex which was used to dip gloves. Selected fillers were montmorillonite (MMT), kaolin and calcium carbonate. Initially fillers were added independently and then as combinations. Mechanical properties such as abrasion resistance tear resistance, cut resistance, puncture resistance and Clark stiffness were measured on cured gloves and compared those properties with each other to identify the best filler or filler combinations for the XNBR latex compound and visual inspection was carried out find out faulty gloves prior to conduct mechanical tests.

The results of the study showed that all these three different fillers could be incorporated with XNBR latex with different proportions and mechanical properties were increased with the addition of fillers up to some extent and then it was decreased with further addition. Cost of the XNBR compound was dropped with the incorporation of calcium carbonate and kaolin. Compatibility of calcium carbonate with XNBR latex was higher in comparison to others and at 18 parts of filler with XNBR gave balanced properties as far as concern quality, cost and processing easiness. 15 parts of calcium carbonate, 0.5 parts of montmorillonite (MMT) and 5 parts of kaolin mixture was successful as three filler combination and cosmetic point of view. 20 parts of calcium carbonate and 0.5phr MMT filler was also a good potential combination as far as mechanical properties and cost were concerned. However as per current day prices of fillers, availability and accessibility, 18 parts of calcium carbonate incorporation was more economical than other two combinations where MMT was used. However MMT has significant positive impacts on loading capability of other two fillers and also on the physical properties.

Calcium carbonate was less defects creative than MMT and kaolin. Specially cracks pinholes and lumps. Therefore it possessed highest loading ability in addition to

physical property enhancement.

Therefore it was obvious that calcium carbonate, kaolin and montmorillonite clay can be used to improve mechanical properties of industrial nitrile gloves while enhancing its profit margin and visual appearance.

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