

## Study of the impact of fillers to improve properties and cost effectiveness in nitrile latex supported gloves while retaining quality

D. Tennakoon,<sup>[1]</sup> R.D. Gunaratne,<sup>[2]\*</sup> and S. Liyanage<sup>[2]</sup>

Carboxylated acrylonitrile butadiene (XNBR) is the widely used synthetic latex for industrial latex glove applications. The focus of this study was to make defect-free, cost competitive industrial gloves with enhanced mechanical properties with the use of XNBR latex compound. Hence three different types of fillers and then their combinations were incorporated into XNBR compound containing other required curatives, to find out most suitable filler or filler combinations for the XNBR latex. Selected fillers were montmorillonite (MMT) clay, kaolin clay and calcium carbonate. Initially fillers were added independently and then as various incremental combinations. Mechanical properties such as abrasion resistance tear resistance, cut resistance, puncture resistance and Clark stiffness were measured on cured gloves. Thereafter, these properties were compared with each other to identify the best filler or filler combinations for the XNBR latex compound. Visual quality inspection was carried out to find out cosmetic defects prior to conducting mechanical tests.

The results of the study showed that addition of all three different fillers into the XNBR latex improved the mechanical properties up to some extent and that it decreased with further addition. Cost of the XNBR compound was lowered with the incorporation of calcium carbonate and kaolin. Compatibility of calcium carbonate with XNBR latex was higher in comparison to others with respect to the mechanical properties and at 18 parts of filler with XNBR, gave improved properties as far as quality, cost and processing easiness were concerned. The 15 parts of calcium carbonate, 0.5 parts of montmorillonite (MMT) clay and 5 parts of kaolin mixture was successful as the filler combination and in a cosmetic point of view. The 20 parts of calcium carbonate and 0.5 phr 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 contributed to fewer defects than MMT and kaolin, specially to cracks, pinholes and lumps, thereby possessing the highest loading ability in addition to physical property enhancement.

Therefore we conclude 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.

**Keywords:** Carboxylated acrylonitrile butadiene / Montmorillonite / Supported gloves / Fillers / Nitrile latex

[1] Hands International (Pvt) Ltd

[2] University of Sri Jayewardenepura. \*gunaratnerd@yahoo.com