IMPROVEMENT OF CHEMICAL AND ABRASION RESISTANCE IN NATURAL RUBBER HOUSEHOLD GLOVES

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ABSTRACT

Chemical and abrasion resistance are important properties that should exist in natural rubber household gloves (HHG) to provide protection. Commercially available calcium carbonate ($CaCO_3$) at 5 parts per hundred parts of rubber (phr) loading level in latex compounds is widely used to provide such properties in HHG which considered as the control in this study. Further improvement of such properties was investigated using commercially available Quartz & Mica. A pilot study proved that use of commercially available Mica gives better properties for chemical and abrasion resistance than Quartz and $CaCO_3$. Therefore, Mica was used for further investigations carried out to identify the effect of both particle size & loading level on chemical and abrasion resistance. Particle size of that Mica was reduced by ball milling of it for 6 & 12 hours. Then un-milled, 6 & 12 hours milled Mica were separately used in compounding of natural rubber latex at 3,4,5 & 6phr loading levels in order to prepare HHG. Chemical and abrasion resistance were measured using Chemical Permeation Cell and taber abrader respectively. Also resulted properties were compared with the control. Feasibility to use Mica in HHG manufacturing by replacing $CaCO_3$ was analyzed using a cost analysis. The highest chemical resistance has shown by 12 hours milled Mica at 6phr loading level with 200% & 238% increase in chemical resistance for 96% Sulphuric acid an Methanol respectively, compared to control. Abrasion resistance has improved by 268% when use 12 hours milled Mica at 5phr loading level. However, un-milled Mica at 3phr loading level has shown considerable improvement in chemical and abrasion resistance compared to control. Therefore, it is feasible to use un-milled mica at 3phr loading level with reduction of filler cost in compounds by 7%.

Keywords: Abrasion resistance, $CaCO_3$, Chemical resistance, Mica