

Coating of Cotton with Blend of Natural Rubber and Chloroprene Containing Ammonium Acetate for Producing Moisture Vapour Permeable Waterproof Fabric

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Abstract : For the purpose of producing moisture vapor permeable waterproof cotton fabric to be used for protective apparel against rain, cotton fabric was coated with the blend of natural rubber and chloroprene rubber containing ammonium acetate as the water-soluble salt, employing a calendar coating technique. Rubber formulations also contained filler, homogenizer, and a typical sulphur curing system. Natural rubber and chloroprene blend in the blend ratio of 30: 70, containing 25 parts of sodium acetate per hundred parts of rubber was coated on the fabric. The coated fabric was vulcanized thereafter at 140°C for 3 h. Coated and vulcanized fabric was subsequently dipped in water for 45 min, followed by drying in air. Such set of treatments produced optimum results. Coated, vulcanized, washed and dried cotton fabric showed optimum developments in the property profiles in respect of waterproofness, breathability as revealed by moisture vapor transmission rate, coating adhesion, tensile properties, abrasion resistance, flex endurance and fire retardancy. Incorporation of highly water-soluble ammonium acetate salt in the coating formulation and their subsequent removal from vulcanized coated layer affected by post washing in consequent to dipping in the water-bath produced holes of only a few microns in the coating matrix of the fabric. Such microporous membrane formed on the cotton fabric allowed only transportation of moisture vapor through them, giving a moisture vapor transmission rate of 3734 g/m²/24h, while acting as a barrier for large liquid water droplet resisting 120cm of the water column in the hydrostatic water-head tester, rendering the coated cotton fabric waterproof. Examination of surface morphology of vulcanized coating by scanning electron microscopy supported the mechanism proposed for development of breathable waterproof layer on cotton fabric by the process employed above. Such process provides an easy and cost-effective route for achieving moisture vapor permeable waterproof cotton.

Keywords : moisture vapour permeability, waterproofness, chloroprene, calendar coating, coating adhesion, fire retardancy

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