The Effect of Fire Retardant Spray, CPVC Cement, and Starch and Amorphous Sodium Polyborate on Increasing the Fireproof Ability of Clothing in Searching for a Cheaper Substitute for Nomex®/Kevlar®

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Firefighter jackets can cost $2,200, which is very expensive, especially for some firefighting departments. This forces them to buy older, possibly less effective equipment. The jackets are made of Nomex®/Kevlar®, a blend of fabrics that exhibits good fire retardant and heat resistant properties. The purpose of this research was to find a suitable, cheaper, similarly effective substitute for Nomex®/Kevlar® for use in firefighter suits and other protective clothing. It was hypothesized that of flame retardant spray, chlorinated poly-vinyl chloride cement and a starch-amorphous sodium polyborate mixture, at least one of the substances would be able to exhibit similar or better flame and heat resistant properties than the current product used. Ninety 7.62 cm. x 7.62 cm. cloth squares and 30 Nomex®/Kevlar® squares of equal size were cut, with the three independent variables randomly and blindly being applied to 30 randomly selected cloth squares, with the groups being labeled A, B and C. The group treatment was revealed after testing and analysis of data concluded. For testing, the samples were subjected to a flame for a maximum of 300 seconds, with the temperature of the fabric being measured every 10 seconds, and the burn through time being recorded. An ANOVA test ($F(3,116)=21759.61$, $p<0.001$) and post-hoc Tukey tests were used to analyze the burn through times, where it was found that the control and A groups were not significantly different, while the B and C groups were significantly different when compared to the control and A groups. Group A was treated with the fire retardant spray, which could be a viable alternative to Nomex®/Kevlar®, while B and C groups were treated with Starch/sodium polyborate and CPVC cement, and were not viable alternatives.

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