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Flame retardants in City of Johannesburg EMS fire fighters bunker gear

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Fire fighting protective garment (bunker gear) is the main shield that fire fighters use for protection against heat, flame and other hazards during fires. The bunker gear's thermal protection is enhanced by the addition of flame retardants, which resist ignition and or reduces the rate of fire spread. Initial investigation of the bunker gear used by the City of Johannesburg EMS fire fighter is found to contain brominated flame retardants, that have been found to be harmful to human and the environment and have been banned or restricted in most parts of the world. Five (5) new and three (3) used bunker gears were investigated. X-ray fluorescence (XRF) scanning measurements showed that all the samples contained significant amount of brominated flame retardants. Comparison of the old (used in fire fighting events) and new samples showed no significant difference in brominated flame retardant content. The fire retardants effects of the samples were investigated using the Cone Calorimeter under 50 and 75 kW.m⁻² external heat fluxes. Heat release rate, smoke release rate and fire spread measurements on the samples showed low values attributed to the retardants in the bunker gear. The average fire growth rate index (FIGRA) for the samples were found to be 1.88 ± 0.44 kW.s⁻¹ (5 new bunker gear) and 2.63 ± 0.37 kW.s⁻¹ (3 old/used bunker gear) for external irradiation flux of 50 kW.m⁻². FIGRA values for external heat flux 75 kW.m⁻² were 5.07 ± 1.12 kW.s⁻¹ and 6.17 ± 0.99 kW.s⁻¹ for new and old respectively. In the case of smoke growth rate (SMOGRA), values found were 3.12 ± 0.34 and 4.96 ± 0.59 m².s⁻², respectively for new and used gears under 50 kW.m⁻² irradiation and 13.26 ± 3.63 and 14.60 ± 2.37 m².s⁻² under 75 kW.m⁻² heat flux.

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