

O22. Firework displays as sources of GSR-similar particles

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For the past thirty years, gunshot residue (GSR) has been considered to be an extremely important piece of evidence to prove or disprove the fact that an individual fired a weapon. It was treated as such because for a period, the residue itself was said to be unique only to firearms, with particles consisting of lead (Pb), barium (Ba) and antimony (Sb) receiving a lot of prominence. However, recent research has challenged this view because it has been shown that particles from occupational and environmental sources may produce similar particles. This means that there is the risk of classifying such agglomerates as GSR, a decision that may result in an incorrect accusation against an individual. It is therefore important for a GSR expert to distinguish between GSR and particles coming from extraneous sources; but is this possible?

A study was carried out to determine if GSR-similar particles can be produced during a professional fireworks display, where large masses of spectators would be exposed to firework discharge residues. Targets were placed at a fireworks display range to collect particle fallout. Analysis using SEM-EDX focused on the detection of GSR-similar particles in terms of particle shape, size, morphology and elemental composition. The majority of GSR-similar particles were excluded on the basis of their elemental profile. However, some particles were indistinguishable from GSR in that the majority are spheroidal, non-crystalline and their elemental profile falls within the criteria of the ASTM E1588-08 standard GSR classification. The population of particles present in a sample may also help in classifying a GSR-similar particle found in that same population. The continuous changes made to primer and propellant compositions by manufacturers also calls for greater consideration when classifying particles as originating from pyrotechnic devices.