



A180 Brake Pad Friction Particles: SEM-EDX Analysis and Comparisons to Gunshot Residue

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After attending this presentation, attendees will gain further insight into standard guidelines in the interpretation of gunshot residue.

This presentation will impact the forensic community by discussing the similarities of brake pad particles to gunshot residue.

Gunshot (primer) residue (GSR) analysis utilizing scanning electron microscopy/energy dispersive X-Ray spectroscopy (SEM/EDX) is the preferred method in Forensic Science. ASTM International issues a standard, E1588, which is the foundation document for the collection, analysis, and interpretation of SEM/EDX data, primarily on automated systems. In 2007 this standard underwent its required five year review. Two major changes were issued in the new document: (1) particles consisting only of the elemental triad, lead (Pb), barium (Ba) and antimony (Sb) are characteristic of GSR while Ba-Sb containing particles are no longer considered in that category, and (2) only trace levels of iron (Fe) are allowed in characteristic or consistent (Pb, Ba, Sb, Pb-Ba, Pb-Sb, Ba-Sb) particles. The impetus for the latter was based primarily upon published results of Torre, et.al. (*J. For. Sci.*, **2002**, 47(3), 494-512) in which particles attributed to automotive brake pads had chemical and morphological properties akin to GSR. The former revision is not a topic for this presentation.

The brake pad particle/GSR similarities have been broached by the defense in Court. While an experienced GSR analyst would not confuse the two species, the analyst will most likely not have observed such particles aside from the published images and spectra of Torre, et.al. To that end, we have undertaken a study of both rim and rotor particles from sixteen vehicles belonging to employees of the Harris County Medical Examiner's Office (HCMEO). Particles were obtained by gloved wipes of either left front rims or rotors. The sampling medium in all cases was aluminum stubs affixed with double-sided carbon tape. Each glove was sampled prior to wiping the surface of interest. The vehicles were all late- model (1996 to present). The analysis of these samples was performed via SEM/EDX was performed according to Standard Operating Procedures in place at the HCMEO using an ASPEX Corporation Personal SEM II. Automated classification was carried out during the analysis using ASPEX Corporation Automated Feature Analysis/GSR Reporter software. All particles classified as either characteristic of or consistent with GSR were reexamined in detail for confirmation of their chemical and morphological properties.

A total of 265,622 particles were classified during this experiment. Thirty-one characteristic (Pb-Ba-Sb) particles were classified but none was confirmed. Particles classified as consistent with GSR totaled 3,806 and only three (Sb) were confirmed. Eight Pb containing particles were detected but owing to significant Fe composition were not confirmed as per E1588-07. Over 75% of the particles classified fell into an iron-rich category.

Two striking features of these results are noted in that no characteristic particles were confirmed in this study and the paucity of Pb in the population. A discussion of these results in light of current knowledge of brake pad composition will be presented. A case study of GSR from a victim of an accidental firearm discharge will be presented.

Gunshot Residue, Brake Pad, SEM-EDX