



### D38 Takata Airbag Inflator Module Failure and Metal Fragment Analysis: Death Number Nine

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After attending this presentation, attendees will better understand how Polarized Light Microscopy (PLM), Scanning Electron Microscopy/Energy Dispersive X-ray Spectrometry (SEM/EDS), Fourier Transform Infrared Microspectroscopy (FTIR), and 3D X-ray computed tomography were used to determine the source of a metal projectile recovered from the driver of a 2006 Ford® Ranger® after a fatal accident.

This presentation will impact the forensic science community by providing information to assist in the investigation of fatalities that were the result of airbag inflator module shrapnel.

The Takata airbag module recall is the largest automobile manufacturer recall in history. A brief history of airbag design, construction, and airbag recall history will be provided to attendees to provide the background of the investigation. While being driven, a 2006 Ford® Ranger® airbag deployed when the vehicle collided with an object in the road resulting in the death of the driver.

At autopsy, a metal fragment, approximately 22.6 millimeters in diameter, was recovered from the deceased Ford® Ranger® driver. MVA Scientific Consultants was asked by the Lancaster County coroner's department to determine the source of the metal fragment. Visual examination was performed of the submitted airbag module, which consists of a plastic cover (the piece in the center of the steering wheel covering the folded undeployed airbag), the airbag itself, and the airbag inflator. An airbag initiator is located within the airbag inflator. The base of the airbag initiator points toward the steering wheel nut (away from the driver) and contains the electrical connector used to activate the airbag when a collision is detected. The metal fragment from the deceased and the airbag module (less the airbag) were examined. Images supplied by the coroner's office revealed a second metal fragment impaled on the steering wheel nut that resembled the metal fragment obtained from the deceased. Micro chemical testing using the hanging drop method (chloroplatinic acid) and PLM were used to confirm the presence of ammonium ions on this metal fragment. Other residues, such as strontium, were detected on the airbag inflator components using SEM/EDS. Adhesive tape residue on the metal fragment recovered from the deceased was consistent in physical characteristics and chemical composition with tape residue on the airbag inflator as determined by FTIR microscopy. Fracture surfaces on the metal fragment from the deceased and on the metal fragment impaled on the steering wheel nut demonstrated that the two fragments were originally from the same piece of steel (the initiator). Pressures produced during detonation of the airbag inflator were sufficient to distort the steel inflator housing. 3D X-ray computed tomography of a detonated exemplar airbag inflator revealed the internal structure, initiator position, and construction of the Takata inflator. The metal fragment collected from the deceased was the result of the steel initiator fracturing then coring through the steel inflator module housing, rupturing the airbag and penetrating the neck and spine of the deceased.

#### Reference(s):

1. Roger W. Barrette, Adam M. Hyde, Richard S. Brown. Investigation of Hit and Run Crashes, Chapter 14, *Traffic Crash Investigation* 11<sup>th</sup> Ed., J. Stannard Baker, Lynn B. Fricke, Eds. Northwestern University Center for Public Safety, Evanston, IL. 2014.

#### Microscopy, Takata Airbag, Death Investigation

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