B154 The Analysis of Gunshot Residue and Plastic Deposits From 3D Printed Polymer Firearms

Carol Crowe, BS, Colorado Bureau of Investigation, 6000 W 54th Avenue, Arvada, CO 80002; Alex Rugh, MS*, Colorado Bureau of Investigation, 6000 W 54th Avenue, Arvada, CO 80002; and Lisa Casey Yoshida, BS, 690 Kipling Street, Ste 2400, Denver, CO 80215*

After attending this presentation, attendees will better understand the residues that result from the discharge of an Acrylonitrile Butadiene Styrene (ABS) polymer firearm.

This presentation will impact the forensic science community by providing information that may be applied to casework in determining indications of polymer firearm use in crimes.

In recent years, there has been a significant increase in the availability of 3D polymer printers for use by individuals. These personal 3D printers are relatively sophisticated, while their affordability and ease of use make them ideal for home hobbyists. At the same time, designs and instructions for producing firearms by 3D printer are readily accessible on the internet. The production of these types of guns raises many concerns to law enforcement and has an unknown impact on the forensic science laboratory analysis of evidence collected during the investigation of shooting events.

Samples were collected during the discharge of five different 3D printed polymer firearms including both .22 Long Rifle (LR) and .380 Automatic Colt® Pistol (ACP) calibers. Scanning electron microscope stubs with carbon impregnated adhesive tabs were secured near the guns during discharge. Samples were analyzed for primer Gunshot Residue (pGSR) using a Scanning Electron Microscope with Energy Dispersive Spectrometer (SEM/EDS) and automated GSR analysis software. The instrument was operated using parameters typically used in casework at the Colorado Bureau of Investigation Forensic Services Laboratory. Each sample analyzed was positive for the presence of particles characteristic of Gunshot Residue (particles with lead, barium, and antimony combined in discreet particles with distinctive morphologies of pGSR). The number of characteristic GSR particles detected varied among the guns. This study attempted to determine if residues originating from a polymer gun have distinctive features that differ from the typical pGSR particles that are recognizable by the SEM/EDS automated particle analysis technique. Some of the detected pGSR particles have unusual shapes. This indicates a fusion of residues containing both polymer and typical primer components.

ABS plastic residues were present in samples, both on the SEM stubs and in the residues collected from the muzzle discharges. The detection of ABS residues presents analytical challenges for routine forensic polymer analysis. Infrared (IR) microspectroscopy was employed to characterize the polymer residues.

This presentation will report the results of the analysis of samples collected from the discharge of 3D printed polymer guns.

Gunshot Residue, 3D Printed Firearm, Polymer