B205 Polymer Replication of Cartridge Cases for Proficiency Testing and Evidence Transfer

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After attending this presentation, attendees will understand the polymer replication process as applied to the replication of cartridge cases. Attendees will be able to perform the basic steps required in replication, as well as perform measurements/analysis of casing replicas to quantify the degree of similarity to the original masters.

This presentation will impact the forensic science community by aiding in the production of large proficiency testing sets that have a very high similarity between sets. This will help reduce errors introduced by variations between sets, thereby improving their effectiveness. Casing replicas can also be used for evidence transfer where chain-of-custody requirements inhibit the transfer of forensic evidence between agencies.

For the past several years, the National Institute of Standards and Technology (NIST) has worked on developing a validated polymer replication process for fired bullets. Quantitative analysis of bullet replicas has shown that polymer replication is a viable option for producing quality replicas that are virtually identical to the master bullets.

The NIST is now developing a process for replicating cartridge cases. Similar to bullet replication, it consists of a two-stage process in which a negative mold is first produced using silicone, then a positive cast replica is produced using polyurethane. While the process is similar to bullet replication, there are several key differences due to the specific geometries of the cartridge case surfaces being replicated. These will be described, as well as the measurement and analysis methods used in quantifying the degree of similarity of the replicas to the master cartridge cases.

Proficiency testing sets are commonly used to ensure forensic examiners are trained and qualified to examine forensic evidence. Typically, these testing sets are produced by repeatedly firing well-marking guns to produce the large number of samples required; however, even well-marking guns still have slight variations from one firing to the next. This can negatively influence the results of proficiency testing. Having the ability to replicate a master set of cartridge cases to a high level of detail is extremely beneficial. This allows multiple sets to be produced without significant differences between them. Using the polymer replication process, this can be achieved.[1] Large sets of casings can be produced and distributed, and the true results of the proficiency testing can be compared without any additional error introduced due to variations between sets.

Another important use for polymer replication is the transfer of forensic evidence. In many cases, evidence that is part of an ongoing investigation cannot be transferred to other agencies; however, due to the nature of violent crimes, it is sometimes necessary to exchange evidence with neighboring agencies to determine if there are additional links to other criminal cases. By using polymer replication, replicas of the original evidence can be shared with other agencies while maintaining chain-of-custody requirements.

Reference(s):

1. Koch A., Katterwe J. Castings of Complex Stereometric Samples for Proficiency Tests in Firearm and Tool Mark Examinations. *AFTE Journal.* Vol. 39 (4), 2007.

Polymer Replication, Cartridge Case, Proficiency Testing