B134 Silicone-Based, Cost-Effective Alternatives to Traditional Casting Material for Large-Scale Impressions

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Learning Overview: The goal of this presentation is to present a method to create a new material for casting that will be a cost-effective, storable, and durable option for use in making large-scale impressions.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by demonstrating that it is possible to create a cost-effective alternative to traditional casting materials for use on large-scale impressions, with considerations for in-field documentation and collection.

Traditional casting materials such as AccuTRANS™ and Microsil™ have been used successfully for many years to create casts of small impressions, such as those caused by tools. Larger impression evidence has been traditionally cast with products such as dental stone; however, its use is limited due to the weight and fragility of the resulting cast. In addition, storage and transport of a large cast can be problematic. While AccuTRANS™ and Microsil™ produce good-quality, fast-drying impressions that are lightweight, the cost of these materials may be prohibitively high if a large impression needs to be cast. Through the manipulation of different caulking compounds, in addition to various additives, it is possible to make a compound that is cost-effective, fast-drying, and retains a detailed cast without compromising the integrity of the impression substrate.

Three different types of caulking compounds were studied: 100% silicone-based compounds, acrylic latex-based compounds, and compounds comprised of a mixture of silicone and acrylic latex. Ten grams of each caulking compound were applied to a masonry brick with surface imperfections generated by a hammer and chisel. The caulking compounds were then allowed to dry completely and were then removed from the brick. Each caulking compound was evaluated on drying time, ease of removal, and impression quality.

After preliminary evaluations of the caulking compounds were completed, three classes of augmenting compounds were used in conjunction with each of the caulking compounds: spray-releasing agents, Monster Liquid Latex™, and Calcium Nitrate Tetrahydrate (CNT). The spray releasing agents were used to form a barrier between the casting compound being tested and the impression substrate in order to ease removal. It was determined that the use of spray-releasing agents greatly diminished the detail quality of the impression. The addition of Monster Liquid Latex™ at a ratio of 10:1 (caulk:liquid latex) increased the pliability of the casting compound; however, it also increased the drying time required. CNT was added to each of the caulk-liquid latex mixtures in an effort to reduce drying time while retaining the flexibility of the compound and quality of the cast.

To date, the best impressions have been obtained using a combination of 100% silicone caulk and liquid latex. It has been possible to obtain a detailed and reliable cast of the impression after a drying time of approximately three hours for the size of impressions used in the study. Research is ongoing to further reduce the drying time through the use of CNT while still producing a quality impression that retains integrity over time. Future research includes testing the optimized formula on a variety of substrates, temperature conditions, moisture conditions, drying time as a function of impression size, and assessing the scalability of the optimized compound.

Evidence Collection, Casting, Impression

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