

Article

Potassium Birnessite Deposition on Unfired Cartridge Cases

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Abstract: A new cost-effective, simple, and reproducible chemical method for the visualization of latent fingerprints on unfired cartridge cases and also on flat metal surfaces (made of zinc-plated steel, stainless steel, lead, copper, and aluminum) has been designed. This chemical method is based on a deposition of potassium birnessite on the uncontaminated metal surface in the valleys between the fingerprint ridges. The chemical deposition is performed by successive immersion (dip coating) of the cartridge cases into aqueous solutions of manganese(II) chloride and potassium permanganate. The deposited material is examined with x-ray powder diffraction analysis, and the visualization of the fingerprints is characterized on the first, second, and third level with high-resolution photography. This research was carried out on samples of 30 unfired cartridge cases of different calibers and different origins and on 5 different metal surfaces, resulting in the visualization of the latent fingerprints with very good contrast. The designed method is applicable for forensic investigations.

Introduction

Latent fingerprints can be visualized by applying two general methods: (1) fine powders and brushes and tape lifting [1] and (2) optical and chemical processing. Sometimes the methods are combined and there is no clear boundary to separate them (e.g., using black powder and acid etching for revealing fingerprints

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