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ABSTRACTS**

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## Application of copper electrodeposition processes in visualization of latent fingerprints obtained on various substrates

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Fingerprints, known for their specific topography, contain physical and biochemical information that is extremely important for personal identification and evidence. A special place in the analysis of fingerprints belongs to the research of visualization methods of invisible, so-called latent fingerprints.

The basic principle of visualization of latent fingerprints is to create a contrast between the fingerprints and the background. Then latent fingerprints become visible to the naked eye and can be further processed.

In this research, visualization was achieved by electrochemical deposition of copper coatings on conductive surfaces on which fingerprints were left. Fine-grained copper films were electrodeposited by direct current (DC) regime onto brass, stainless-steel and monocrystalline silicon substrates. The development of latent fingerprints and the quality of visualization are influenced by the initial surface roughness, microstructure, color and orientation of the substrate.

The quality of visualization was compared on untreated substrates and substrates that were mechanically and chemically treated before leaving fingerprints.

In addition to the properties of the substrate, the quality of visualization is influenced by the microstructure and properties of copper coatings. The application of electrolytes of different composition with variable deposition parameters led to significant changes in the microstructure of the coatings.

In this study, a basic sulfate electrolyte for electrochemical copper deposition and a sulfate electrolyte with additives to improve coating quality were used. It has been shown that for the visualization of latent fingerprints, it is better to use an electrolyte without additives. The use of electrolytes with additives has not been shown to be adequate for these purposes due to the effect of filling fingerprint ridges and reducing contrast.

The optimal duration of the electrodeposition process was determined experimentally depending on the type of substrate, roughness and the degree of surface treatment of the substrate and electrodeposition parameters.

The quality of the application of the electrochemical deposition of copper in order to visualize latent fingerprints was assessed visually and by applying optical microscopy for specific details.

**Keywords:** Latent fingerprint, forensic science, copper electrodeposition, additive chemistry

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