Faculti Summary
https://faculti.net/dynamics-and-mechanism-of-the-physical-developer-process-for-visualization-of-latent-fingerprints-on-paper/

This video video discusses the process and chemistry behind physical development (PD), a widely used technique for visualizing latent fingerprint marks on porous surfaces, particularly paper. PD relies on a redox reaction to reveal finger marks that are otherwise invisible to the naked eye. The technique is recognized for its effectiveness but has been hindered by limited research into its underlying chemistry and the recent ban of a key surfactant (Sym N) due to environmental concerns.

The study aims to explore the surface chemistry and dynamics of silver growth in the PD process. It describes the steps involved in developing fingerprints, including pre-washing with maleic acid to neutralize alkaline fillers in paper, followed by immersion in a working solution consisting of surfactants and silver nitrate. The resulting silver deposits are examined both macroscopically and microscopically.

Key findings include that sebaceous (water-insoluble) and water-soluble components from finger marks are both essential for optimal development of prints. It was observed that the particle sizes of silver deposits in the working solution are about 880 nanometers on average, and the process allows rapid, selective deposition of silver on latent marks.

Importantly, the study concluded that silver particles grow primarily on the surface rather than in solution, indicating that the nucleation for silver deposition is instantaneous. Compositional analysis confirmed that the developed marks are solely silver, without iron contamination, which plays a role only in the initial reaction during the formation of the working solution.

The research opens avenues for further studies on how different factors, such as paper type and donor variability, might affect the PD process, highlighting the complexity of fingerprint residue and the need for deeper understanding in forensic applications.