

Central Research and Support Establishment Home Office Forensic Science Service

Ninhydrin Analogues and Their Use in the Fluorescent Detection of Latent Fingerprints

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ABSTRACT

Ninhydrin is the standard reagent for revealing marks on paper, where it reacts with the amino acid content of the latent fingerprint deposit to give a purple coloured fingerprint. In order to facilitate improvements a range of ninhydrin analogues have been synthesised.

Better contrast may be obtained by using benzo(f)ninhydrin which gives a dark green product with amino acids. To increase sensitivity the ninhydrin/amino acid complex can be rendered fluorescent by treatment with salts of group 2b metals such as zinc chloride. The use of high powered light sources such as lasers and xenon arc lamps greatly facilitate detection. 5-Methoxyninhydrin marks after treatment with zinc salts give more intense fluorescence, at room temperature, than the ninhydrin/amino acid/zinc complex. However, developing these marks and subsequent treatment with zinc salts requires strict control of humidity, and maximum fluorescence intensity is obtained on cooling to liquid nitrogen temperatures (77 K, -196 °C). Although fluorescence intensity of the mark increases when cooled in liquid nitrogen this may be more than offset by an increase in background fluorescence.

To overcome these problems we have recently synthesized a new ninhydrin analogue, 1,8-diazafluoren-9-one (DFO) which gives a red coloured product which is highly fluorescent (maximum excitation at 470 nm, maximum emission at 570 nm). Unlike ninhydrin and 5-methoxyninhydrin, no further treatment with zinc salts is required to render it fluorescent and maximum fluorescence is obtained at room temperature. The fluorescence is considerably greater than with either of these reagents.

The reagent is prepared by dissolving 0.05 g of DFO in a mixture of 4 ml methyl alcohol and 2 ml of acetic acid, and then diluting to 100 ml with 1,1,2-trichlorotrifluoroethane (CFK-113, frigen). Exhibits are immersed in the freshly prepared solution for 5 seconds and allowed to dry for 30 seconds: after repeating the immersion and drying cycle marks are revealed by placing in an oven at 100 °C for 10 minutes. Strict control of humidity is not required. Operational trials involving the reagent have established that DFO revealed 2.5 times more identifiable fingerprints than ninhydrin/ZnCl₂.

The reagent is protected by patent (British Patent Application No. 8826237.2) and has been safety tested. It should be labeled CAUTION: HARMFUL IF SWALLOWED.

Further developments to synthesise analogues bases on the DFO molecule are being pursued.

N.B. Maximum fluorescence is at 530 nm (instead of 470 nm mentioned).