Research of organic explosives, by HPTLC, on white cloth soiled with blood

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Introduction

The fires and explosions section of the Lyon Laboratory of Forensic (Scientific Police) has a mission which is to determine the origin, accidental or voluntary, and the cause of disasters to go on the spot and to carry out analyses. In explosion cases, the analysts have difficulties in identifying, by High Performance Thin Layer Chromatography (HPTLC), the explosive substances used from clothes soiled with blood. Indeed, blood contains impurities which obstruct the revelation of organic explosives. The researches will deal with four organic explosives: TNT, PETN, RDX and NG. Two technologies are developed during the placement but one of them consists in sample purification with a liquid liquid extraction.

Experimental conditions ant sample preparation

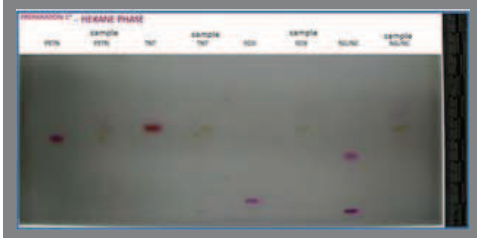
Chromatograph HPTLC CAMAG automated with winCATS software was used for this study. The plates used were Silicagel HPTLC plates 60 F254 10 x 20 or 10 x 10 cm. The classical method uses trichlorethylene/acetone 9/1 (v/v) as developing solvent and an acetone extraction for sample preparation. And, the spray reagent for visualization was KOH on ethanol at 3% and Griess reagent (sulfanilamide and NED in acid solution). To purify our samples, we extracted explosive substances, from white cloth soiled with blood, with acetonitrile and the extraction solvent chosen is hexane. We chose this extraction solvent because we thought that the impurities were essentially fats (esterified fatty acid and cholesterol). The developing solvent used was trichloroethylene/acetone 9/1 and the protocol of acetonitrile extraction was:

- Putting on white cloth 120 µL of explosive and 1 mL of blood
- Leaving the cloth to dry during 1h
- Adding almost 20 mL of acetonitrile and extract the explosives
- Filtering solution through filter paper
- Putting the solution on decantation container and extract with 1 x 10, 1 x 15 and 2 x 20 mL of hexane
- Reducing the volume then introducing the solutions in a vial.

The acetonitrile and hexane phases were studied by HPTLC comparing samples front-end ratios with references.

Figure 1: HPTLC plate of samples extracted with acetonitrile and washed with hexane
Developing solvent : trichloroethylene/acetone
Acetonitrile phase

Figure 2 : HPTLC plate of samples extracted with acetonitrile and washed with hexane
Developing solvent : trichloroethylene/acetone
Hexane phase



Results and conclusion

We see all the explosives on HTPLC plate of acetonitrile phase and there is not any explosive revealed on hexane plate (Figures 1 and 2). So, with extraction, we were able to purify our samples without losing any explosives in the washing phase. In addition, we saw impurities on HPTLC plate of hexane. But they were also visible on acetonitrile plate. This was not a problem because all the explosives were revealed. So, with this technology, we were able to reveal our four organic explosive substances: TNT, PETN, RDX and NG. But, we had to optimize it. Indeed, the sample purification did not allow having a "clean" sample.