

Fast chromatographic method for explosives profiling

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The security control is becoming a real issue in some strategic locations like airports, official buildings, stations... Agencies in charge of security need powerful tools to detect the presence of warfare agents such as explosives. The detection of their volatile signature is one of the fastest and easiest approaches to achieve this task. However, the detection of volatile organic compounds (VOCs) released from explosives is challenging as explosive chemicals are poorly volatile and decompose easily at high temperature. Additionally, the method has to be sensitive and fast to be used on the field.

In this project, we developed fast chromatographic (GC and GC×GC) methods to improve the description of specific volatile signatures from explosive samples. Because the vapor profile of explosives is not too complex, part of the separation space can be sacrificed in order to obtain a fast chromatographic separation method. The fast GC approach allows to decrease the elution temperature and to adequately reduce the thermal degradation of sensitive compounds such as the ones present in the nitro explosives. Using a fast GC×GC approach, the limit of detection can be enhanced by the cryofocusing effect linked to the modulation. As far as we know, the method we propose is the first to allow the detection of RDX and HMX compounds in the headspace of commercial explosive samples.

The technique is to be tested on other explosives and to be implemented on portable GC devices for field applications. Moreover, the volatile signature of these products will help police dog trainers to improve their training methods.