Development of Portable Mass Spectrometer for Explosives and Narcotics Detection

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Introduction

Mass spectrometry (MS) has the potential to improve trace detection for security applications through improved selectivity, greater threat library size and availability of additional information provided by MS/MS analysis. The improvements offered by MS increase reliability of detection, thus minimizing requirements for secondary searches, and should also significantly reduce false alarms.

Methods

The MS prototype is based on a linear ion trap (LIT) analyzer with atmospheric pressure (API) interface. To achieve efficient ion transmission with a small vacuum system a novel ion funnel design was implemented. Sampling methodology that is currently in use by security professionals such as TSA screeners is based on swab collection. A thermal desorber (TD) interfaced to the LIT analyzer is used to liberate sample from the surface-sampling swabs. Desorbed sample vapors are ionized using a dielectric-barrier discharge (DBD). Testing of the TD-MS system is performed by depositing explosive and narcotic standards on swabs.

Preliminary Data

Analytical figures-of-merit, including sensitivity and selectivity, will be presented to demonstrate the capability of the system for detecting trace levels of target explosives and narcotics.

Novel Aspect

A portable mass spectrometer with an efficient API interface developed to meet security checkpoint functional and analytical requirements is described.