

## Second Laureate Applied Research

Scientific Committee: Chemical Technologies

Research Work Title

### A Hand-Held Detector of Contraband Chemicals for Promoting Social Security



Executive Organization

Institute of Materials and Energy, Iranian Space Research Centre

Representative

Amir Hossein Alinoori (Ph.D.)

Collaborators

Seyed Alireza Ghorashi, Saeed Hajialigol, Mehdi Zamani Joharestani, Saeed Asghari, Seyed Mehdi Narimani, Majid Masjedi Esfahani, Hamed Sheikhabaei, Fazlollah Hojati, Kamal Sadeghian, Abdollah Azad

#### Abstract

This project aims to design and fabricate a portable detector system for small quantities of materials. It is implemented based on an automatic thermal injection of real samples to a fast columnless gas chromatography coupled with an ion trap and accelerator as well as an integrated spectrogram system for field and real-time data recording and analysis. Since the designed detector is a type of chemical one, all samples must be converted to a gas phase prior to analysis. Evaporation usually occurs with increasing temperature and thermal desorption. This device includes an internal suction sampler whose task is to automatically inject real samples. The collected samples are then immediately introduced into a rapid thermal gas separation system (columnless gas chromatograph) and the actual sample separation operation is performed using thermal pulse width modulation. Trapping chemical compounds on an inert adsorbent is one of the most important and common pre-concentration methods. The main and highly effective point in the manufactured product is to perform the pre-concentration operation after injection into the device internally so that a special mesh can be used at the beginning of the tube. This does not require additional methods and equipment before injection and the relevant mesh is automatically cleaned after each injection. The various parts of the detector cell are miniaturized making the device more portable.

