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Trace 2,4-Dinitrotoluene Detection using Suspended Membrane Micro-hotplate Based on Heat Absorption Monitoring

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Highlights

- Design and fabrication of an explosive sensor based on heat absorption monitoring (HAM)
- Testing the HAM sensor with DNT and finding the sensor features
- Fabricated sensor can detect DNT as little as 20ppb within 72ms by the applying power of 3.7mW
- Regarding to the experimental results, the HAM sensor has good selectivity to DNT, high repeatability and reproducibility

Abstract

Detection of trace explosive has become an outstanding research activity recently, and there is a demand for fast and reliable detection techniques. In this paper, the detection of trace 2,4-Dinitrotoluene (DNT) as a nitroaromatic explosive based on heat absorption monitoring (HAM) is introduced which employs heat absorption phenomenon during melting process of explosive particles. Thermodynamic analysis shows that the sensitivity of HAM sensor will be enhanced by increasing of heating efficiency; therefore, the sensor has been designed based on suspended-type membrane (STM) micro-hotplate with the small active area and narrow tethers to achieve high heating efficiency. The designed sensor is fabricated by a simple micro-fabrication process using bulk micromachining technology and the electrical and thermal characterization is performed. Experimental results demonstrate that the fabricated HAM sensor is

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