Summary of Abstract

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Title: Development of Surface Acoustic Wave (SAW) Based Sensors

Keywords: Surface Acoustic Wave, Sensors, Chemical sensing, Temperature Desorption, Magnetic sensing

Summary:

SAW devices and systems have several excellent characteristics in comparison to other technologies. SAW sensors are highly sensitive, have outstanding stability and fast response.

In the thesis, SAW sensors have been designed, developed, tested and used for chemical and physical sensing using novel methods/configurations.

A simple, cost effective and novel approach of SAW thermal desorption spectroscopy for selectivity and detection of CWA by adsorption and desorption on uncoated SAW device, has been developed. Another novel work has been carried out for detection of gases through measure of their thermal conductivity. In this method also, uncoated SAW device was used as sensing element by exploiting its high sensitivity towards temperature. The device was maintained at a high temperature (100-150 °C) and exposed to a flow of gases at ambient temperature. Surface Acoustic Wave (SAW) magnetic field sensor based on magnetostriction effect has also been designed and developed using a simple and inexpensive approach. A novel coating approach was adopted whereby a thin layer of Polyvinyl Alcohol (PVA) was coated on bare SAW device to passivate and electrically isolate the Inter Digital Transducers (IDTs) followed by thin layer of PVA nanocomposite magnetostrictive coating applied using drop dry method. Separate sensors were realized using Nickel (Ni) and Iron (Fe) materials and their performances were evaluated using a Helmholtz coil. Good magnetic sensitivity and repeatability was observed in developed sensors.