PROJECT TITLE: DEVELOPMENT OF MAGNETO PLASTIC SENSOR FOR DIAGNOSIS OF VASCULAR DISEASE

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As most of the vascular disorders show variation in pulse wave velocity, arterial stiffness determination is the possible tool to diagnose such diseases successfully. The aim is detection of pulse wave and determining the pulse wave velocity using a novel sensor known as magneto elastic sensor. This sensor can be used as a direct diagnostic tool for observing several vascular disorders and atherosclerosis related diseases. The sensor uses a non-invasive detection of the heart generated blood pressure waves which propagates along the arteries near the skin surface . A novel sensor for non-invasive pulse wave detection has been developed using the magneto-elastic principle . the sensor can be used for non invasive detection of the heart generated blood pressure waves which propagates along the arteries near the skin surface. The shape and velocity of the pulse wave travelling through arteries is related to heart function and blood vessels health .The proposed work shows that magneto-elastics principles can be successfully used to detect small oscillations such as the ones generated by the pulsation of the blood vessels using a simple device and extends the type of wave sensors

PROJECT TITLE: BIO SENSOR FOR PNEUMONIA DETECTION USING MEMS DEVICE
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Special Category" Motorola FAER AWARD"

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A biosensor is a device which converts biological activity into quantifiable signal. Most conventional microelectromechanical (MEMS) and nanoelectromechanical systems (NEMS) are designed for detecting and sensing. The sensing principle varies according to the device, the nature of the analyte molecules, and the precision required. Capacitance, piezo-resistance and resonance frequency are among the sensing principles depending upon the mechanical properties of the device. The biosensor structure is designed and simulated using coventorware software. This biosensor can be designed as a microdiagnostic kit to detect diseases. This microcantilever based biosensor can detect pneumonia by immobilizing specific antibodies on the microcantilever. These antibodies are specific to cholesterol in pneumonia bacteria. When the patient sample containing pneumonia is placed on the cantilever biochemical interactions take place on the upper surface of the microcantilever. This causes microcantilever to bend and facilitates to detect the presence of pneumonia.
The aim &objective of the project is

- To design a micro-cantilever based biosensor.
- To detect pneumonia by immobilizing specific antibody.

OBJECTIVE

- To stimulate the biosensor structure using coventorware software.
- To identify the mass absorbed by the MEMS chip using capacitive sensing.
- To determine the output of biosensor by varying the capacitance values.

PROJECT TITLE: ASTHMA DIAGNOSIS BY EXHALED NITRIC OXIDE
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Introduction

Asthma is one of the respiratory ailments due to chronic airway inflammation. Nitric oxide is produced by the epithelial cells of bronchial wall as part of inflammatory process. Asthma patients will secrete more amount of Nitric oxide and released in the exhaled air. Monitoring the NO production and transport in the lung is necessary for the analysis of respiratory disorders. Thus by measuring the concentration of Nitric oxide in the exhaled air, severity of the asthma can be evaluated which helps the physician to determine the drug dosage level. It can be an additional test for the analysis of the disease.

Problem Definition Existing method of asthma diagnosis includes airway biopsy and sputum analysis which is an invasive method and also time consuming process. An approach of non-invasive method to diagnose asthma includes nitric oxide measure from the exhaled air. The Chemi luminescence technique measures the exhaled nitric oxide by reacting it with the ozone and this method is of patient discomfort since it requires forced exhalation. The other drawbacks includes, it needs external clean air for ozone generation and expensive vacuum pump system. Annual check of chemical reaction converters and ozone generators is needed to ensure the supply of ozone for the chemical reaction with the Nitric oxide. Other gases in breath can disturb the chemical reaction of NO with O3 and may interfere with accurate analysis of nitric acid, especially quenching effects due to carbon dioxide and water. NIOX MINO developed by Aerocrine and recently developed NO breath by Bedfont uses the electrochemical sensor in which the fractional exhaled Nitric oxide is measured for the analysis. The sensor used must be replaced after 100-200 measurements that make the device costlier. So a sensor that measures the nitric oxide from the exhaled air in a accurate way must be designed with high sensitivity. Design approach and Implementation The IR source reacts with the targeted gas molecule only at the particular wavelength. In case of NO, the fundamental and strongest absorption is in the mid-infrared region at 5.3μm. The sensor must be designed in such a way that the frequency of the IR source must be varied using POT which is controlled using PIC microcontroller. IR frequency at which it reacts with the NO will be fixed using the wavelength obtained. (Wavelength= 1/ Frequency). Hence the IR will react with the NO even though the exhaled air contains a mixture of gases such as CO2, O2, N2 etc. The detector detects the IR and the absorbed IR is correlated to the concentration of the NO which is displayed in the LCD. The LCD will display three readings, the set frequency; reference value obtained from the normal persons after the comparative study and the observed NO concentration from the individuals.

PROJECT TITLE: PREPARATION AND CHARACTERIZATION OF COLLAGEN BASED PLANT EXTRACT INCORPORATED WOUND DRESSING MATERIAL FROM CHROME CONTAINS LEATHER WASTE

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The inappropriate caring of the burn wound may delay its healing, causing the area to become infected and subsequently resulting in chronic wounds. In this study, methanolic teak leaves extract (Tectonagrandis)has been incorporated into collagen sheet and the bio-composite has been evaluated for its physical, biological properties and also its in-vitro wound healing efficacy using 3T3 fibroblast cell line. This composite sheet is cost-effective, as collagen is being extracted from chrome shavings a by product of tanneries, in which teak extract is incorporated. The results showed that addition of teak leaves extract increased the water absorption capacity (184 %), tensile strength properties (1.11 N/mm^2) and also stability of composite sheet against lysozyme. The characteristic spectra of collagen is shown by IR spectrum of amide I, II and III absorption bands at 1663, 1555 and 1242 cm^{-1} respectively. The bio-composite sheets have exhibited anti-microbial properties and extract release studies show 80 % extract release in 4 hrs. MTT based proliferation assay shows that collagen–teak bio composite sheets are not cytotoxic to cells and also supports the growth and proliferation as indicated by increase in cell number with respect to time. Wounds are physical injuries that result in an opening or break of skin. Healing process is initiated in response to an injury .Wound healing is a complex process that results in the contraction of wound and restoration of a functional and integrity of damaged tissue. It involves continuous cell-cell and cell-matrix interactions that allow the process to proceed in three overlapping phases: inflammation, cellular proliferation and re-modelling . The presence of free radicals and microbes on the wound surface affects the healing process. There is substantial evidence of the role of antioxidants acting against free radicals by scavenging them . Healing of wounds particularly from burns and skin diseases are a great challenge [3] . The fabrication of bio sheet with antioxidant and antimicrobial properties enhances the wound healing activity. Any material that can interact with bio-logical system to treat or regenerate any tissue of the body can be termed as a biomaterial