

Executive Summary



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1. Title of the Project:

Design and Development of Low Power, Low Cost, High-Performance Gas Sensor Array for Exhale Breath analyser: A Point-of-Care based Non-Invasive Early Detection and Prognosis of Cardiovascular Diseases

2. Date of Start of the Project: 01.10.2022

3. Aims and Objectives:

(i). Aim/Deliverables:

- a. A Sensor array Prototype must be developed to detect Cardiovascular Disease Biomarkers such as FENO, CO, Isoprene, Pentane and Trimethylamine (TMA) at ppm/ppb/ppt levels with reduced cross-reference between other biomarkers such as CO₂, Hydrocarbons, Moisture, O₂ etc.
- b. The signal conditioning circuit, which interfaces the data to the Mobile app assuring a point of care prognosis of CVD (Cardio Vascular Diseases) , has to be appended to the Sensor array prototype.
- c. Three prototypes shall be developed during the activity. Validation of the prototype in patient-derived breath samples (100 patients per year) from KIMS hospital (Kerala Institute of Medical Science), Trivandrum, will be performed.
- d. Licensing the technology and initiating the incubation activity.

(ii). Objectives:

- a. Biomarker Identification and Detection for CVD
- b. Synthesis and Characterization of Nanomaterials for Gas Sensing:
- c. Design and Development of Miniature Gas Sensor Array:
- d. Calibration of the Gas sensor with Dual Excitation (Opto-Thermo):
- e. Selective Detection of Biomarker (Gases) by Optimized Nanomaterials: Incorporation of suitable catalysts in the sensing materials.
- f. Evaluation of Exhale Breath prototype and validation

4. Significant achievements (not more than 500 words to include List of patents, publications, prototype, deployment, etc)

3. Significant results :

- a) The design of the sensors is finalised. Necessary procurement has been initiated.
- b) Materials optimisations for gas sensing have been completed.
- c) The biomarker identifications have been completed after discussing with Doctors (Clinicians) from the Kerala Institute of Medical Science (KIMS).
- d) The MoU is signed between the Kerala Institute of Medical Science (KIMS) and the Indian Institute of Space Science and Technology (IIST) to conduct the research.
- e) Necessary processing is going on to get the ethical clearance (Clinical trial) to conduct the research.

5. Concluding remarks

Since the development is initiated only in October 2022, It will take some time to publish a paper. However, the PI is more interested in applying a patent for the same and initiating a start-up.