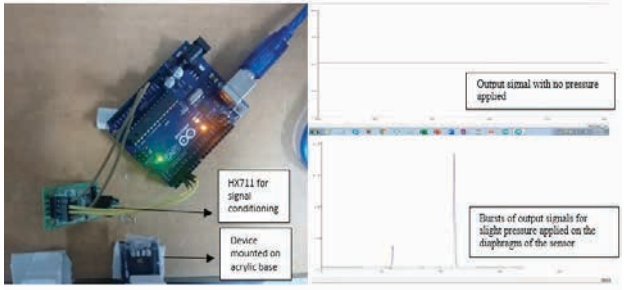
Thin-Film Silicon Piezoresistive Pressure Sensor



Problem Statement: India has the second-largest number of diabetic patients globally (82 million). Diabetic patients develop peripheral neuropathy characterised by loss of sensation in the feet, due to which they have abnormally high-pressure points (>750kPa) under the feet. The skin gets thickened (called callus) in these areas, forming an ulcer even with a minor injury. Chronic ulcers can lead to amputation of a toe or foot. Timely identification and regular monitoring of high-pressure points of feet are highly critical in mitigating this problem. The researchers have proposed a thin film piezoresistive pressure sensor for checking foot pressure.

Uniqueness of the Solution: Aluminium induced crystallisation (AIC) allows the fabrication of microcrystalline silicon on flexible substrates like polyimide at temperatures less than 400°C, greatly reducing the fabrication cost. Polyimide is also used as a diaphragm material, removing the micromachining step. Silicon as a sensing material offers robustness, long-time stability, and easy integration with CMOS technology for readout circuitry. The piezoresistive pressure sensor can also be applied wherever sensitive pressure sensing is needed, such as in robotics, automobile and aviation sectors.

Current Status of Technology: Experimental proof of concept is ready, and the researchers have demonstrated the use of this technology with a colour code map showing variation in pressure application. They have also performed component and breadboard validation of pressure sensors in a laboratory environment.

Societal Impact: Limb amputation leads to pain, loss of productivity and social role, unemployment, increased dependency of patients and also leads to stigma due to distorted body image. Such cases generally occur among rural or poor urban populations who fail to notice or monitor foot ulcers due to lack of sensation. As a result, they get infected and then approach for treatment. Such a population needs more affordable diagnostic solutions, which is one of the highlights of this technology. Most of the current pressure sensing platforms are imported and costly. The proposed technology is cost-effective and highly relevant for the Indian population.

Patent(s): Nil

Relevant Industries: Healthcare, Medical Devices.

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