Interfacial engineering in heterostructures and nanotechnology for rapid prototyping of ethanol sensor

Priyanka Dwivedi[1,a] Saakshi Dhanekar[1,b], Samaresh Das[1,c]

[1]Centre for Applied Research in Electronics (CARE),
Indian Institute of Technology (IIT), New Delhi – 110016, India

[a] *pdpriyankadwivedi@gmail.com*
[b]*sdhanekar@care.iit.ac.in*
[c]*samareshdas@care.iitd.ac.in*

Abstract

A trace amount of human breath is a mixture of ethanol, pentane, acetone and other volatile compounds. These originate from metabolic processes occurring in the organism, environmental exposure, dietary sources and alcohol intake. For example, VOCs in human breath have already been linked to a condition of lung cancer, diabetes and other diseases. Our interest is in the detection of ethanol vapours at sub ppm level to high level in human breath. The aim is to develop an alcohol breath analyzer to be used by the common man. The device for this kind of application should be reliable, sensitive, and operable at room temperature and easily CMOS integrated. This paper presents batch fabrication and rapid prototyping of selective ethanol sensor is being presented. The sensing mechanism is based on the interface engineering of heterostructures. The sensing materials consist of TiO_2 and porous silicon (PS) and technique used is resistive sensing. Sensing data was also collected from single layers like PS and TiO_2. The limit of detection was in sub-ppm level and the sensing response was repeatable and reproducible. The sensors operate at room temperature and were mounted onto TO, DIP packages. These devices can form a basis for development of breath alcohol analyzers to be used by traffic policemen. This work highlights the significance of the interface formed between metal oxide and porous silicon and how this can be formed into a prototype for a social cause.

Keywords—*alcohol sensor, prototyping, interface study, TiO_2/porous silicon*

Professional Biography

Priyanka Dwivedi received her M. Tech. degree in VLSI Design from Banasthali University, Rajasthan, India. She is currently pursuing Ph.D. from Centre for Applied Research in Electronics (CARE) at Indian Institute of Technology, New Delhi, India. She has submitted Ph.D. thesis and her work is focused on MEMS integrated semiconductor nanostructures and 2D materials for sensing applications.



Email Id: pdpriyankadwivedi@gmail.com