INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study	:	Ph.D.

Thesis Title:
Copper Oxide Single-Nanowire-Based Devices and Applications

Name of Thesis Supervisor(s)	:	Prof. Roy Paily Palathinkal
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Transition-metal-oxide semiconductors, including composites in nano-form, are explored widely for photodetectors and volatile organic compound (VOC) sensors in two-terminal and field-effect-transistor (FET) configurations. Photodetectors are generally used in optical detectors, communication, and thermal imaging systems. On the other hand, VOC biosensors have facilitated the early detection, diagnosis, and treatment of diseases and disorders in recent days.

Thesis reports the fabrication of the copper oxide (CuO) single nanowire (SNW) devices for photodetection and volatile organic compounds (VOCs) detection. The first contribution is to fabricate a CuO SNW photodetector. The electrodes are realized using silver nanoparticles (AgNP) microcantilever contact print (uCCP) using spot overwrite and drag techniques. The photodetector exhibits exceptional performance and reliability. The second contribution includes designing the controlled environment chamber (CEC) to measure sensor response for gases and VOCs. The VOC CEC sensing setup facilitates the validation of the point-of-care devices. The third contribution is developing CuO SNW devices of various lengths to sense VOCs such as ethanol, acetone, 2-propanol, etc., at room temperature, 150 degrees C, and under white light. The device response to ethanol at different conditions showed good stability. The fourth contribution is fabricating CuO SNW Field Effect Transistors (FETs) with the bottom gate, coplanar gate, and top gate architectures. The fifth contribution includes the fabrication of fully solution-processed planar capacitors and FET