

Project Name: Development of UV Activated ZnO Quantum Dots Based Hydrogen Gas Sensor

Principal Investigator: Dr. Yogesh Kumar (Assistant Professor Sr. Grade, ECE, IIIT-128)

Funding Agency: Jaypee Institute of Information Technology

Scheme: Institute Research and Development Project Scheme (IRDPS)

Approved Fund: 4.2 Lakhs

Received Fund: 4.2 Lakh

Duration: 10 July 2021 – 9 July 2023

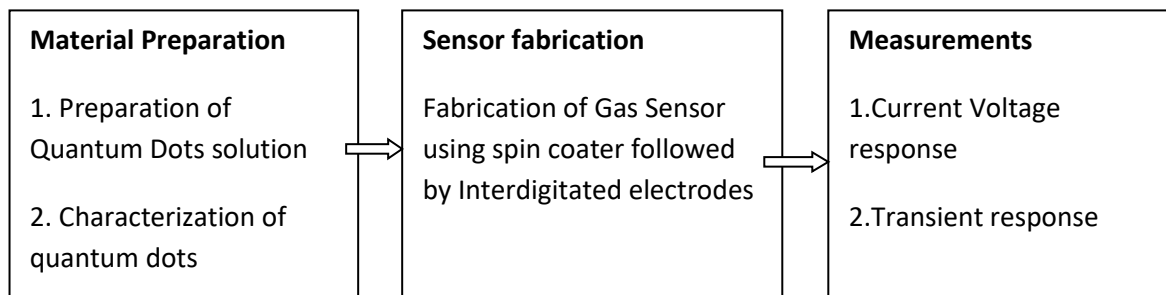
Lab Development:

1. Chemical Lab in IIIT-128
2. Gas flow measurement in IIIT-128

Project Idea:

The semiconducting metal oxide based resistive gas sensors have gained remarkable interest in last few years due to their low cost, highly reliability, fast response and ease to fabrication. In particular, ZnO-based gas sensors play an important role for better performances because of their direct band gap, high electron mobility and high exciton binding energy at room temperature. However, the traditional gas sensors must operate at high temperatures (150 to 400°C) in order to achieve better sensing performance. The requirement of high operating temperature limits their applications for sensing flammable and explosive gases. To overcome this obstacle i.e. operating at higher temperature can be avoided, by using activation of gas sensor using photonic technique to enable room temperature operation of the sensors.

Project flow:



Research Lab Development:

1. Spin Coater (1.5 Lakh)
2. Mass flow controller (1.5 Lakh)

Reference:

1. Chandan Kumar, Gopal Rawat, Hemant Kumar, **Yogesh Kumar**, Rajiv Prakash, and SatyabrataJit. "Flexible poly (3, 3''-dialkylquaterthiophene) based interdigitated metal-semiconductor-metal ammonia gas sensor." *Sensors & Actuators: B. Chemical* 255:203–209, 2017.
2. L. Rajan, C. Periasamy, K. Vijayakumar, V. Sahula, and S. Member, "An Investigation on Electrical and Hydrogen Sensing Characteristics of RF Sputtered ZnO Thin-Film with Palladium Schottky Contacts," no. c, 2016, doi: 10.1109/JSEN.2016.2620185.
3. M. Kumar, V. S. Bhati, S. Ranwa, J. Singh, and M. Kumar, "Pd/ZnO nanorods based sensor for highly selective detection of extremely low concentration hydrogen," *Sci. Rep.*, vol. 7, no. 1, pp. 1–9, 2017, doi: 10.1038/s41598-017-00362-x.
4. Q. Wan *et al.*, "Fabrication and ethanol sensing characteristics of ZnO nanowire gas sensors," *Appl. Phys. Lett.*, vol. 84, no. 18, pp. 3654–3656, 2004, doi: 10.1063/1.1738932. G. F. Fine, L. M. Cavanagh, A. Afonja, and R. Binions, "Metal oxide semi-conductor gas sensors in environmental monitoring," *Sensors*, vol. 10, no. 6, pp. 5469–5502, 2010, doi: 10.3390/s100605469.