69. Title: Field-effect Transistor Device for the Detection of Dissolved Ammonia in Plasma

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Keywords: Bio Sensor, Human plasma

Domain: Smart Technologies (Sensors and MEMS)

Summary: Field-effect transistors (FETs) based on metal-oxide thin film have the advantage of excellent sensitivity, fast response, miniaturized size, and compatibility with bio-analytes. A highly responsive FET biosensor is fabricated based on tungsten trioxide (WO3) thin film to detect the physiological concentration of total ammonia (ammonium NH4+ and NH3) in human body fluids. The elevated level of ammonia in the body fluids indicates damage or improper functioning of organs mainly the liver. Thus, real-time monitoring of ammonia concentration in human body fluid acts as a prognostic marker for liver disorders. The fabricated FET device shows reliable and accurate results for ammonia sensing with the highest response of 498 at 100 µM and a limit of detection of 6 µM. The fabricated sensor shows the capability of real-time ammonia monitoring in plasma with a response time of 9.05 s.

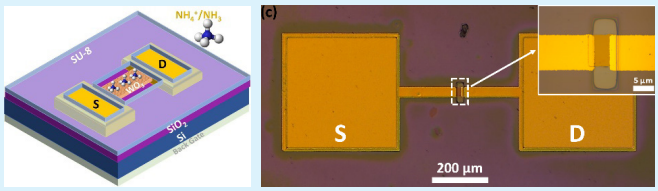

Image: Biosensor for detection of Ammonia in Human Plasma

- Real-time detection of dissolved ammonia as a prognostic marker for liver disorders in human plasma.
- Point of care monitoring of early-stage chronic liver disorders.

- Tungsten trioxide (WO3) thin film-based field-effect transistor to detect the physiological concentration of total ammonia in human body fluids.
- Development of biocompatible, miniaturized transistor biosensor with high sensitivity and quick response.

Advantages:

- Low sample volume requirement (only 2 µl) as compared to the conventional method (2-5ml).
- Real-time monitoring capability, no need for laboratory-based setup.
- Fast and stable response.
- Capable of detecting ammonia in the form of ammonium ions (Ammonia is present in the form of ammonium ions in body fluid).
- Possibility of batch fabrication and compatibility with standard CMOS (complementary metal-oxide semiconductor) fabrication process.
- Lower limit of detection (LOD 6 µm).

Applications: Healthcare Industries

Scale of Development: A functional prototype is fabricated and validated by testing in Laboratory environment

Technology Readiness Level: 5

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