

New Integrated Systems for Biological and Chemical Applications.

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Precise and sensitive tools are needed to investigate further in the biomedical field: to track disease, develop new drugs, or for more fundamental understanding of biological phenomena. Here, new tools, which are multi-purposes platforms for disease detection and biological cells studies, are proposed. They are hybrid systems with integrated micro-electronics, micro-fluidics, and sensors. They allow a multitude of investigation approaches: electrical, optical, chemical and biological.

TFT Display Panel Technology as a Base for Biological Platform

Purpose: Thin Film Transistor (TFT) technology allows the fabrication of transparent glass substrates covered with a dense array of transparent microelectrodes, individually controllable. This technology is used here for biological cells applications like manipulation, sensing, electrical and optical studies.

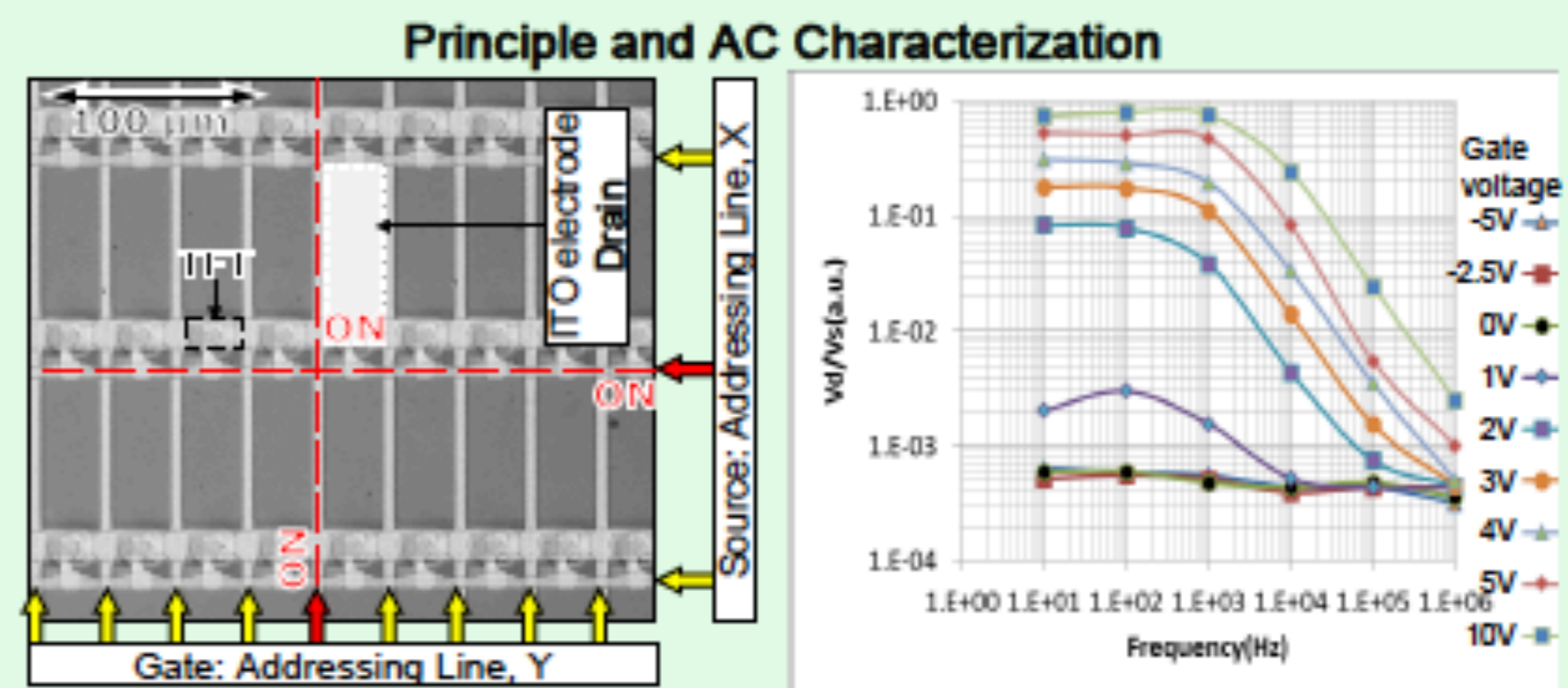
Originality: Possibility to create a biological multi-purpose platform.

LCD Panel Zoom
TFT-LCD Structure: Upper glass, Polarizer, Color Filter, TFT, Lower glass, Spacer, Liquid Crystal.

Biological Application Setup: PDMS chamber, Optical observation, TFT device, Addressing Line, Y Source, Gate, PCB, Function Generator, Power Supply.

Features of the Device

- 80% transparent. Broken tablet display on a magazine. Upper and lower glasses: still attached. Lower glass alone.
- 82% of the surface is covered by independent microelectrodes.
- Fluorescent fibroblast cultured observed by inverted microscope.
- TFT array substrate, petri dish, 96 well plates: SAME SIZE.



On Going Applications

- Dielectrophoresis: AC** - Technique to move, concentrate, separate cells. $t = 10s$. Source 3V, 100kHz. Gate 3V.
- EWOD: DC** - Technique for transportation, mixing and separation of droplets.
- Impedance Spectroscopy: AC** - Technique for cells monitoring: number, death, attachment.

Impedance Spectroscopy Graphs: Normalized impedance vs Frequency (Hz) and Phase Shift (deg) vs Frequency (Hz). Includes plots for Beads: Negative DEP and Yeast Cells: Positive DEP. Gate: 3V, Source: 1V, 100kHz.

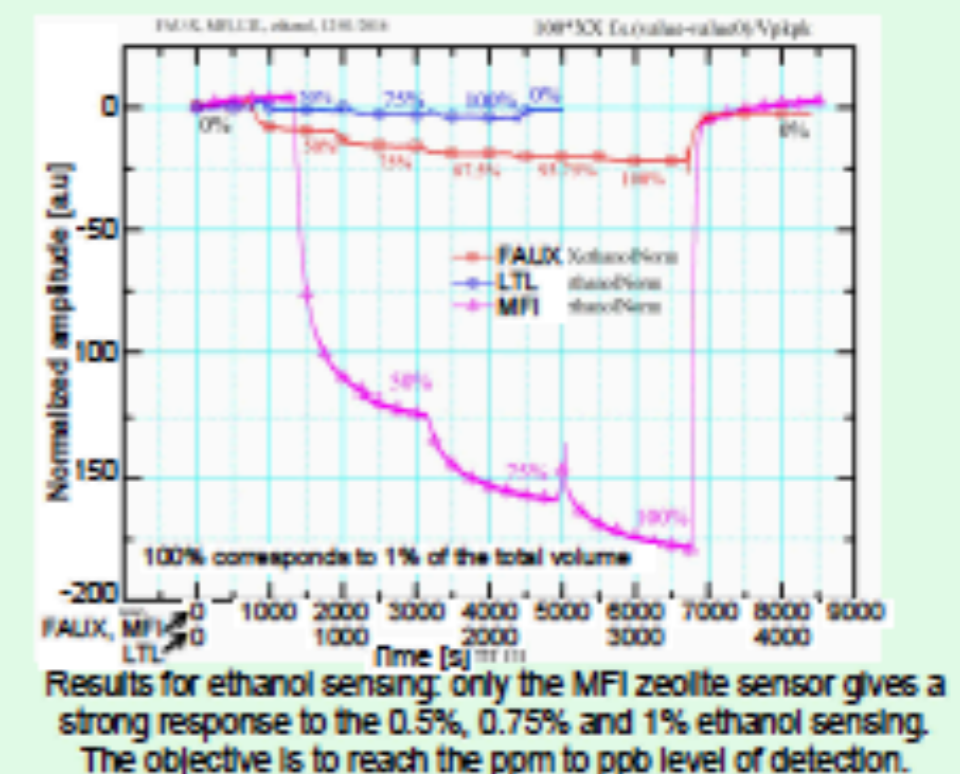
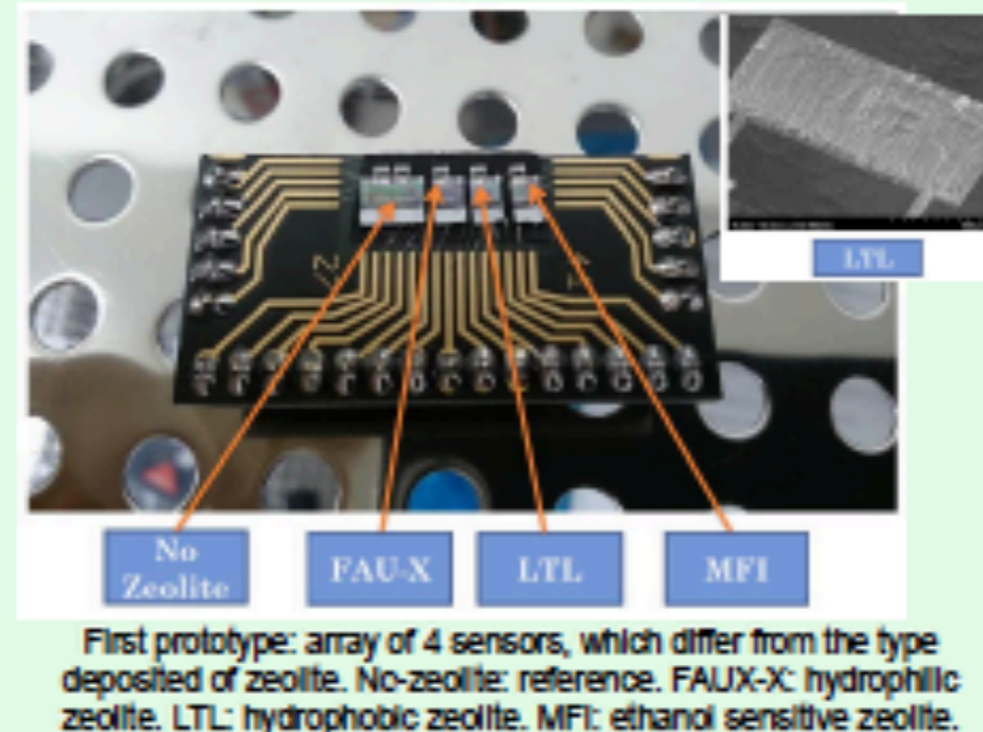
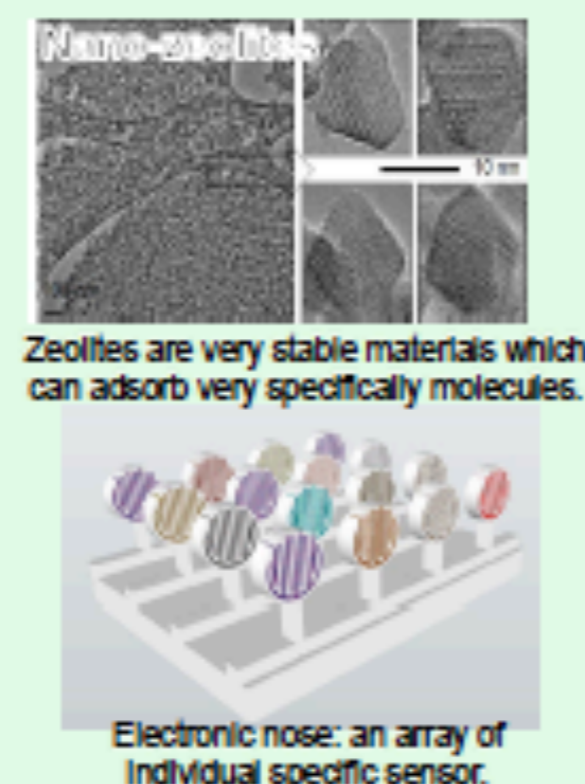
Yeast Cells Monitoring: Yeast cells number monitoring and Yeast cells death monitoring.

NEZ ZEN: A Nano-structured Electronic Nose with Nano-Zeolites, and Innovative Electronics

Partners: IIS - Utokyo; GREYC and LCS, ENSICAEN (France); VDEC - UTokyo

Purpose: Develop a highly sensitive electronic-nose, using zeolites and innovative electronics for disease sensing.

Originality: With zeolites highly stable and specific sensitive layers can be obtained. Thermal sensing is proposed.



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