Portable Biomedical Diagnostic Inspection System using BioCMOS technology

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PITTCON CONFERENCE & EXPO 2015

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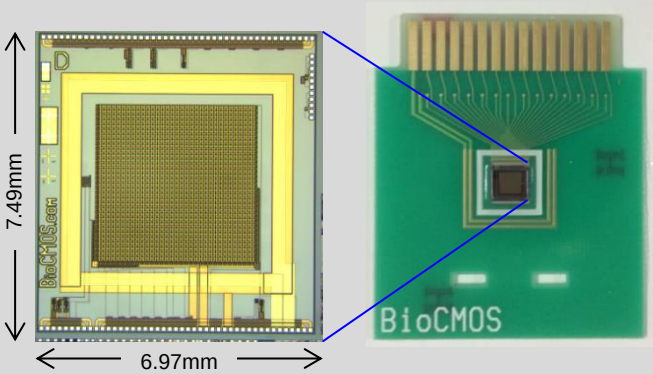
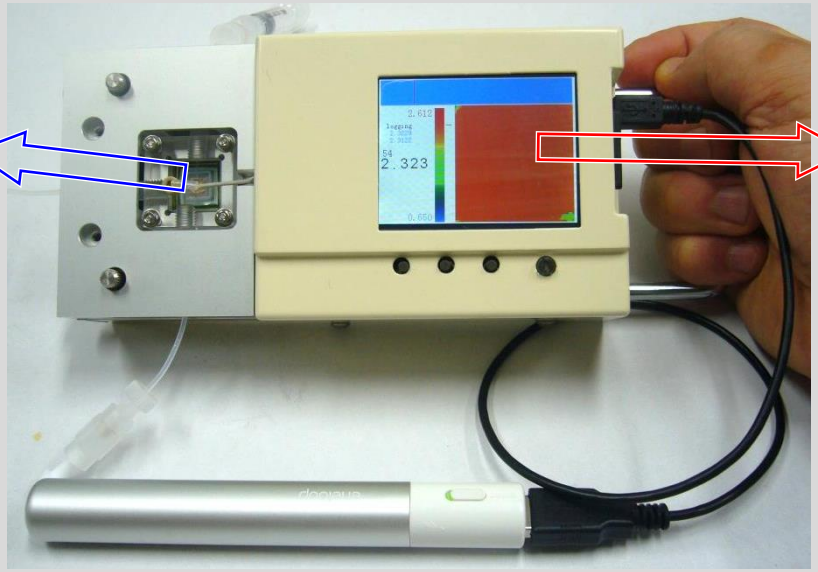
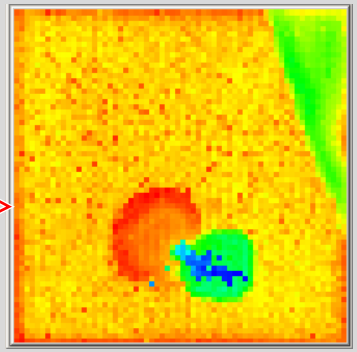


64x64 sensor array BioCMOS chip

electrochemical sensor

potentiometric
amperometric
impedimetric



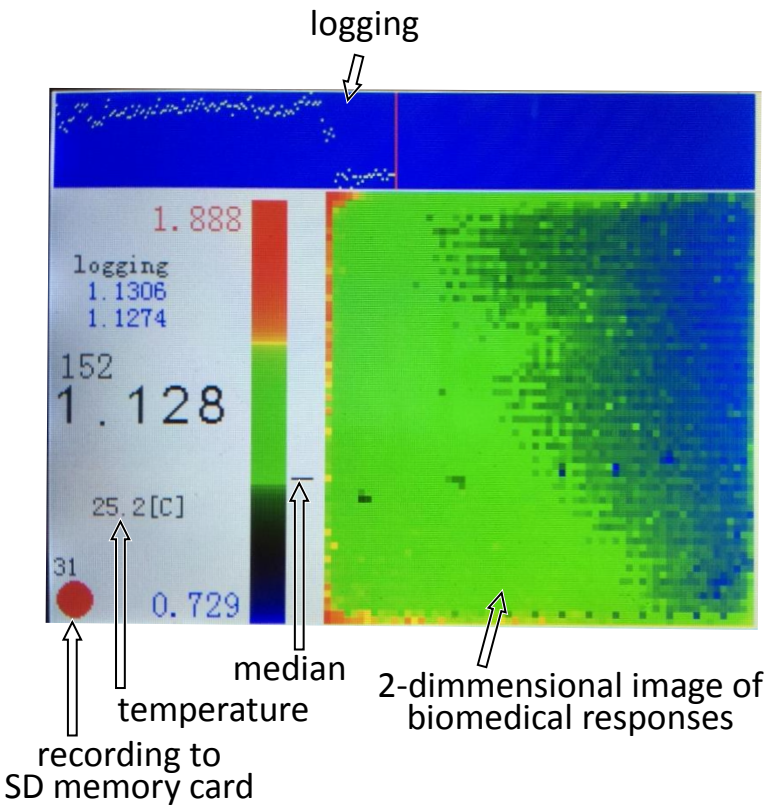


2-dimmensional image of biomedical responses

applications

home healthcare
gene-based diagnostic
virus detection
food security
evidence-based care
drug discovery

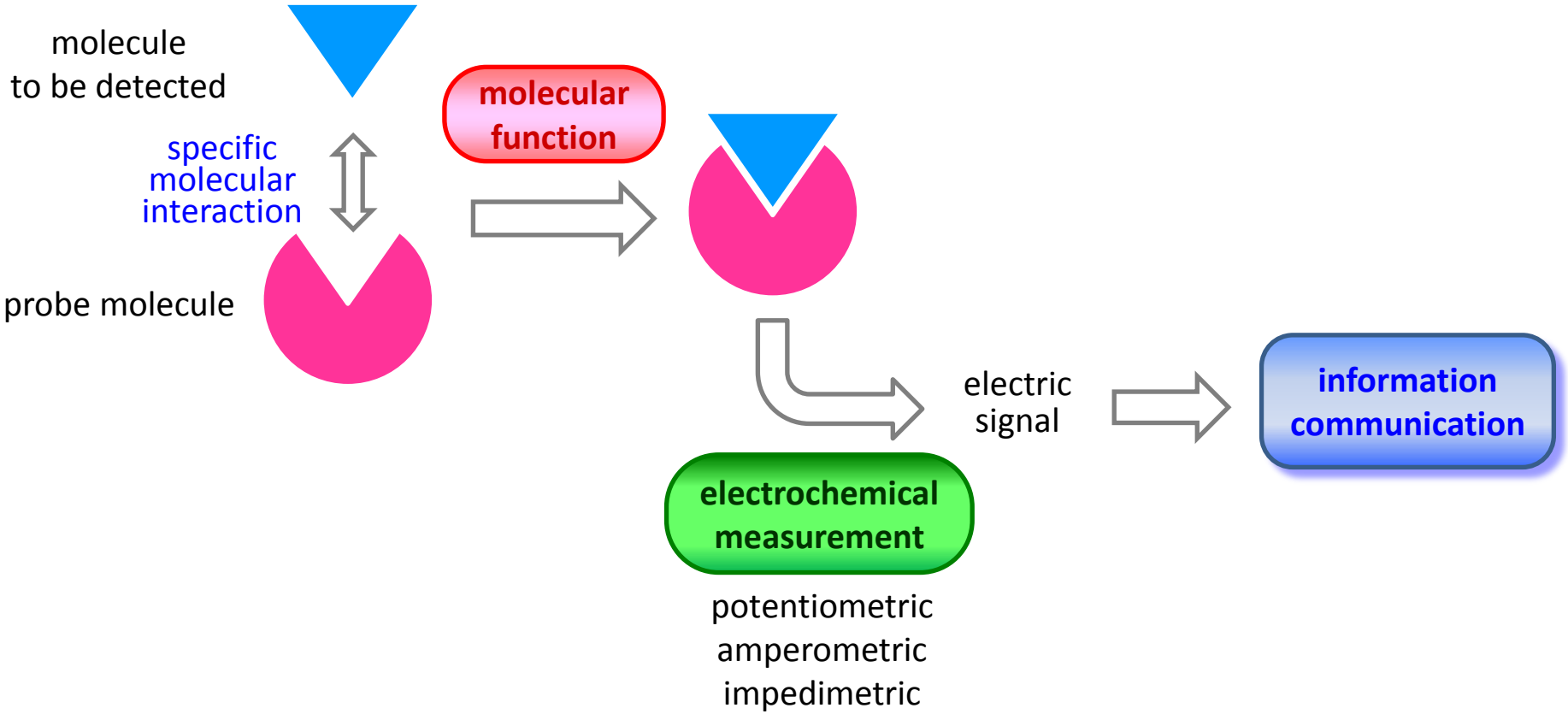
Electrochemical Biosensor using Large Scale Integrated Circuit



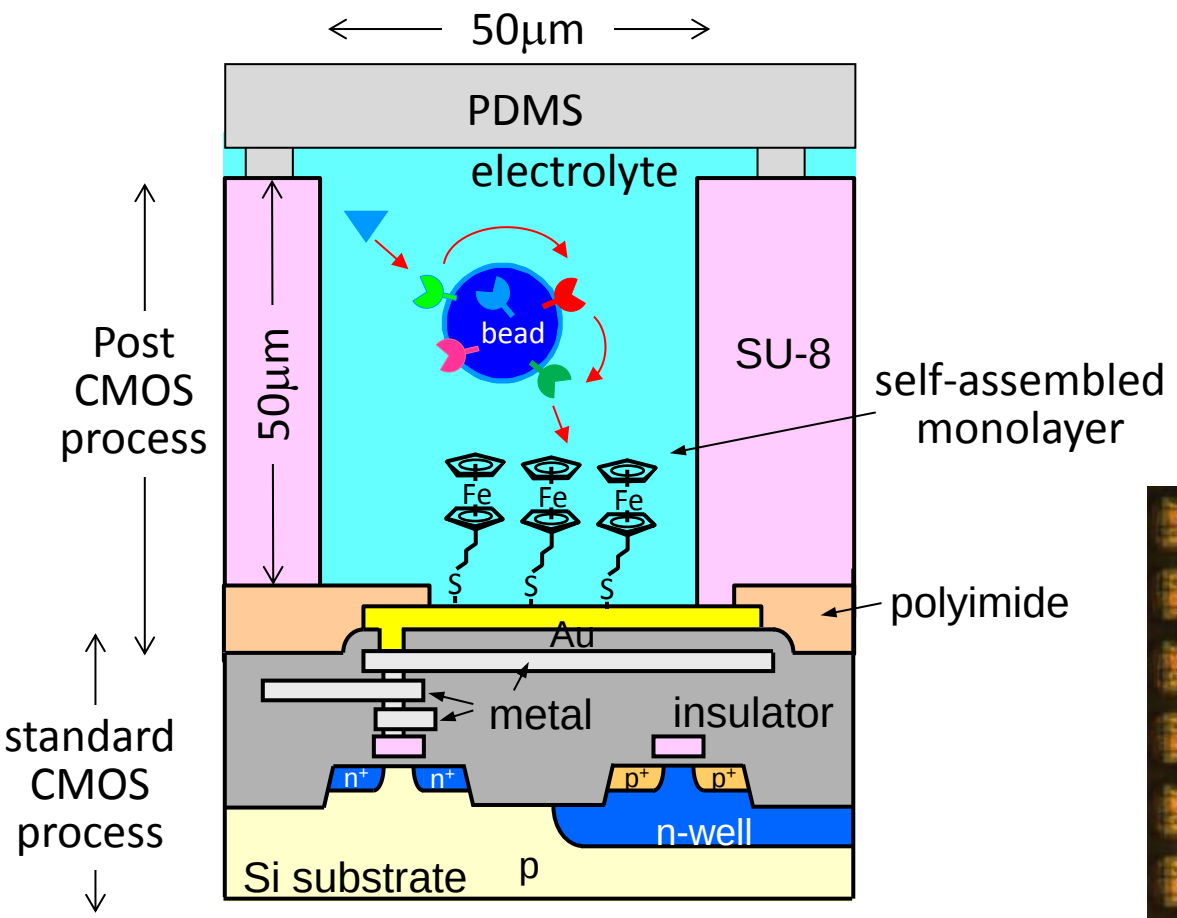
- ☑ stand-alone
- ☑ handheld
- ☑ low noise battery operation
- ☑ temperature control

principle of electrochemical biosensor

recognition + transducer



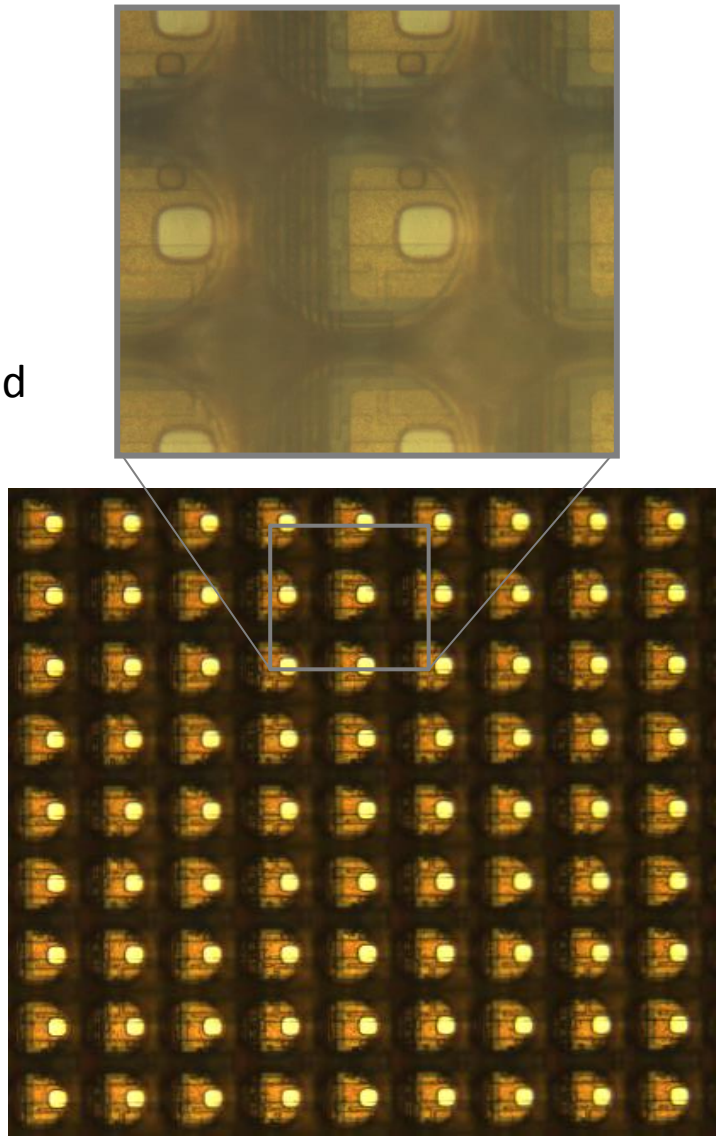
Sensor structure



schematic cross-section

target (to be identified)

probe (enzyme, antibody, primer, …)



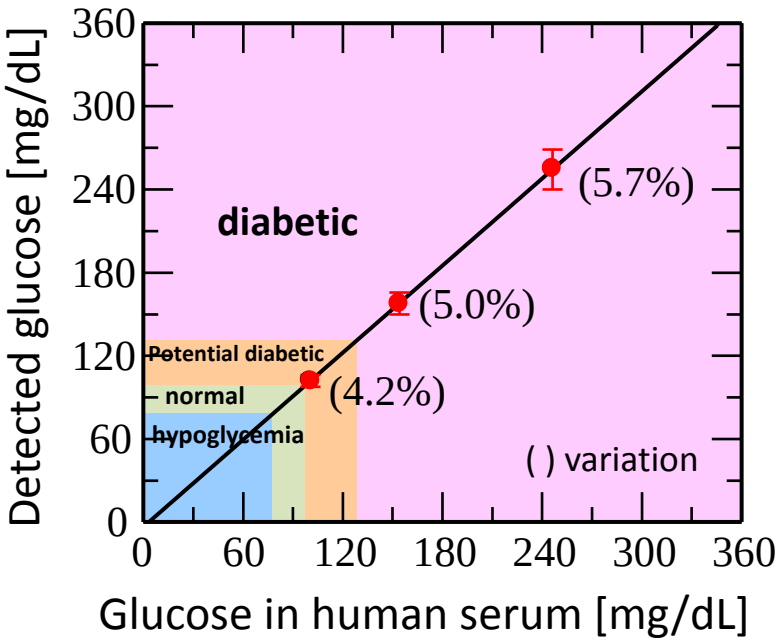
plan view (photomicrograph) of sensor array

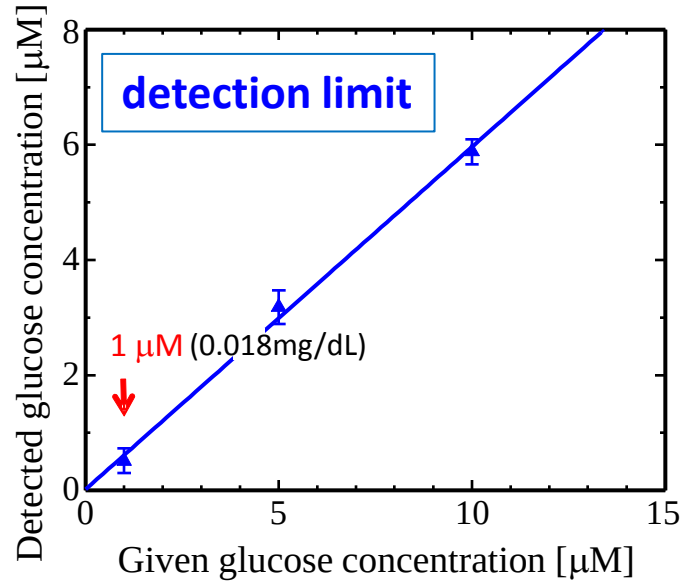
Application I

Glucose Sensor

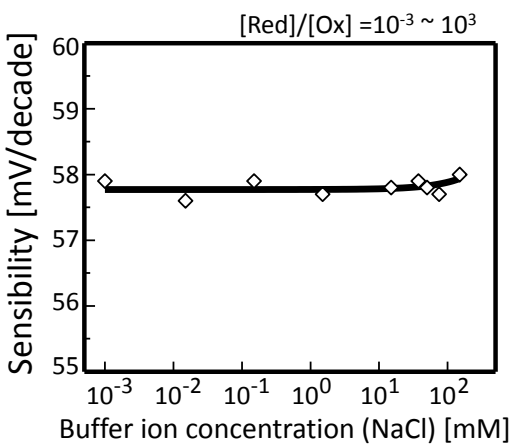
H. Anan, M. Kamahori, Y. Ishige, and K. Nakazato, *Sensors and Actuators B: Chemical* **187**, 254-261, 2013

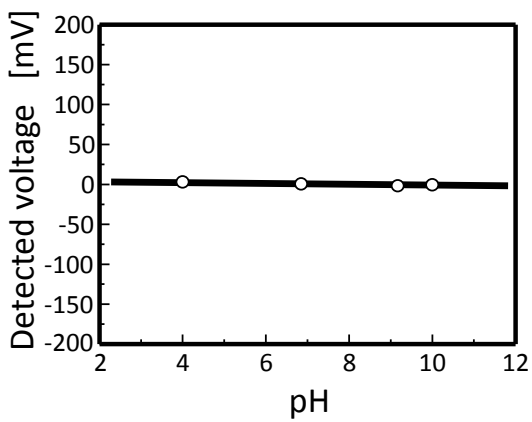
H. Komori, K. Niitsu, J. Tanaka, Y. Ishige, M. Kamahori, and K. Nakazato, BIOCAS 2014

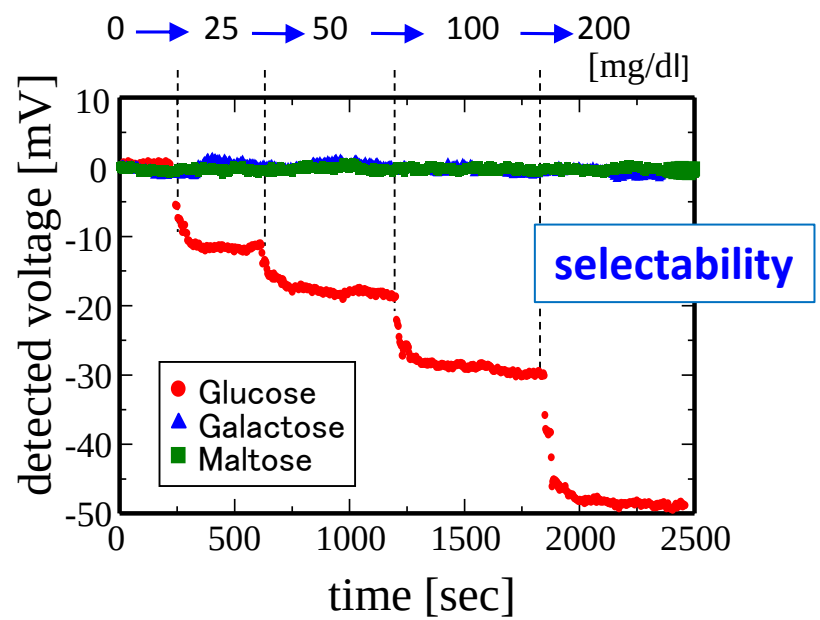




wide buffer condition

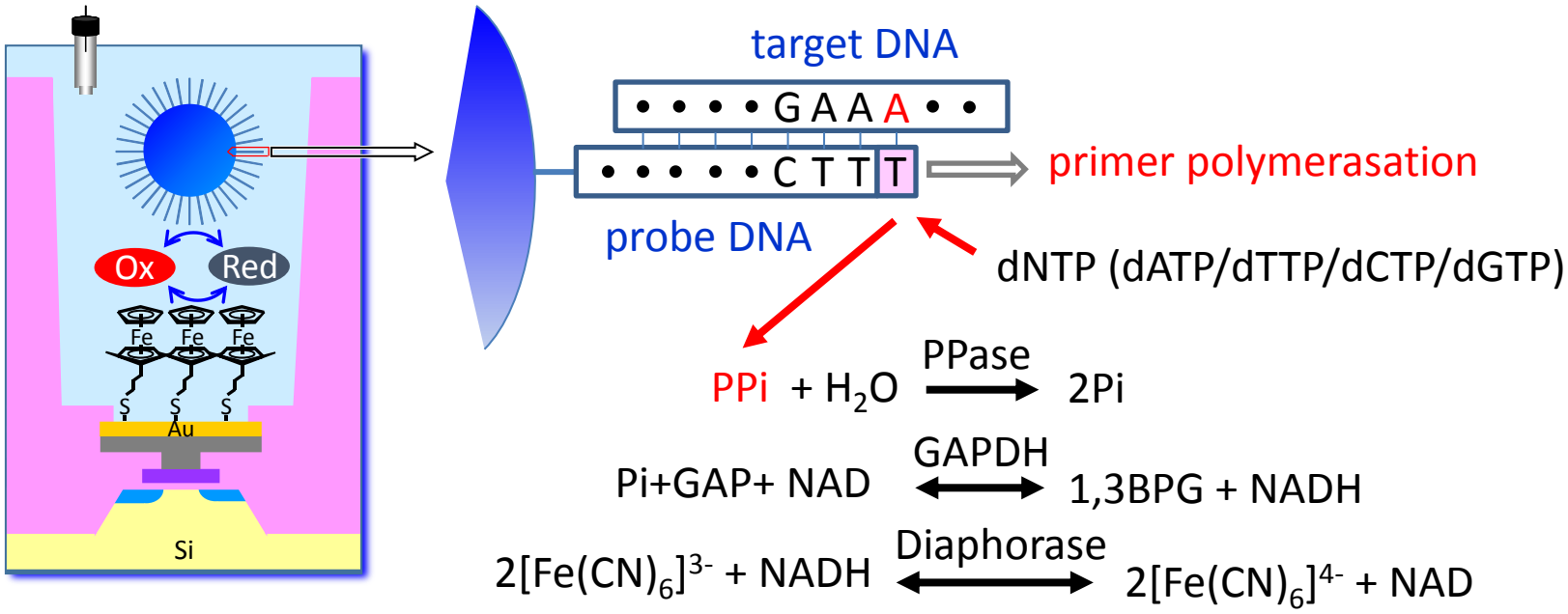


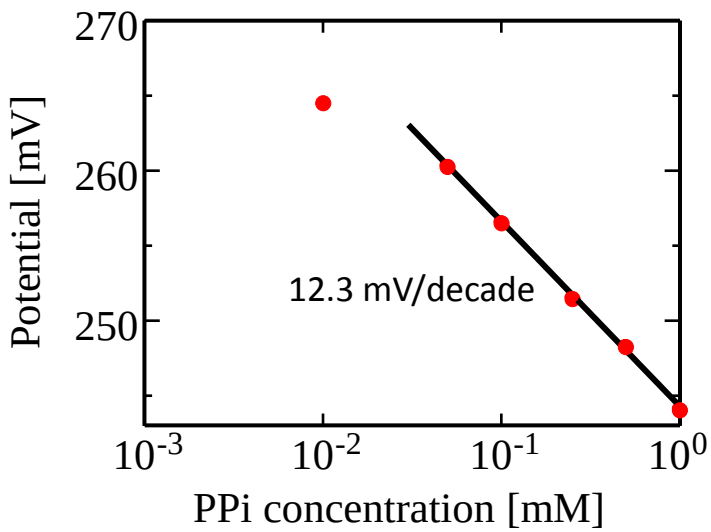


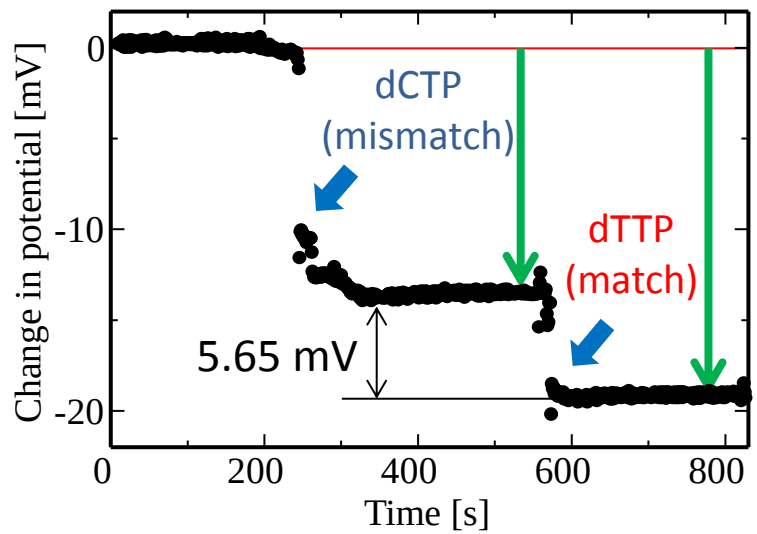


Application II

gene-based diagnostic



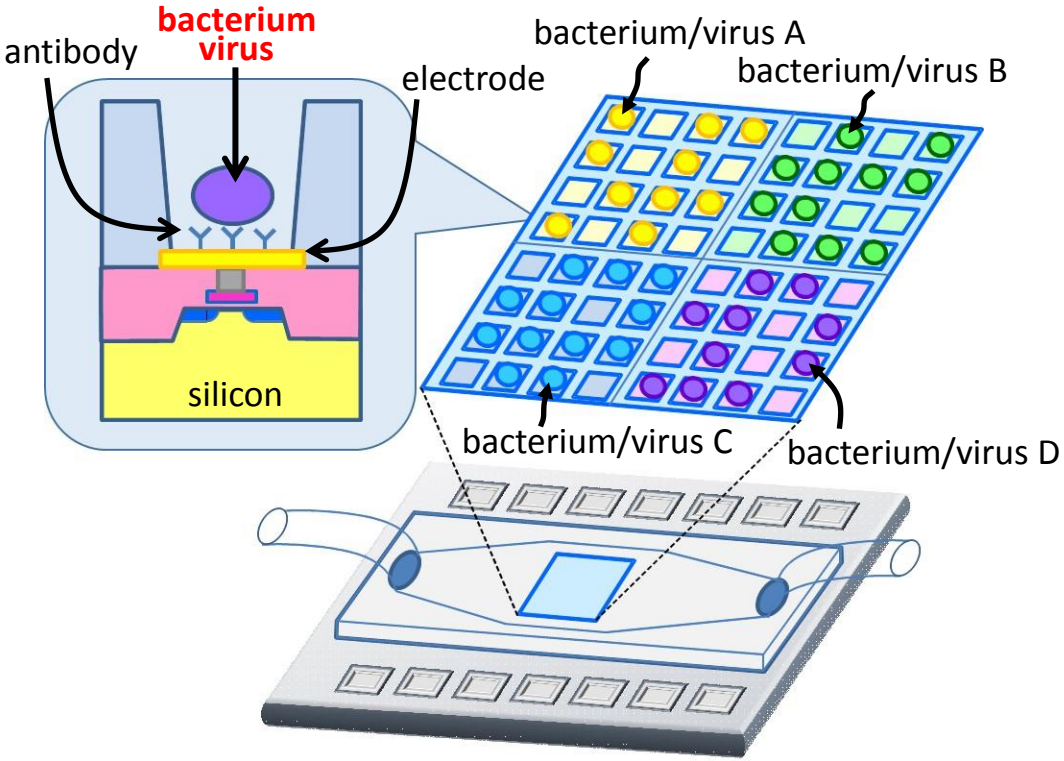


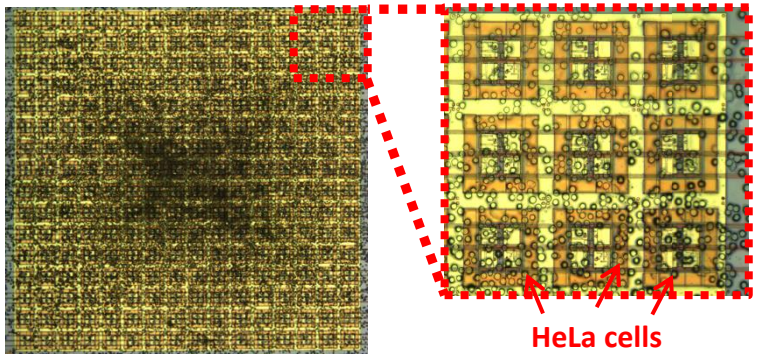


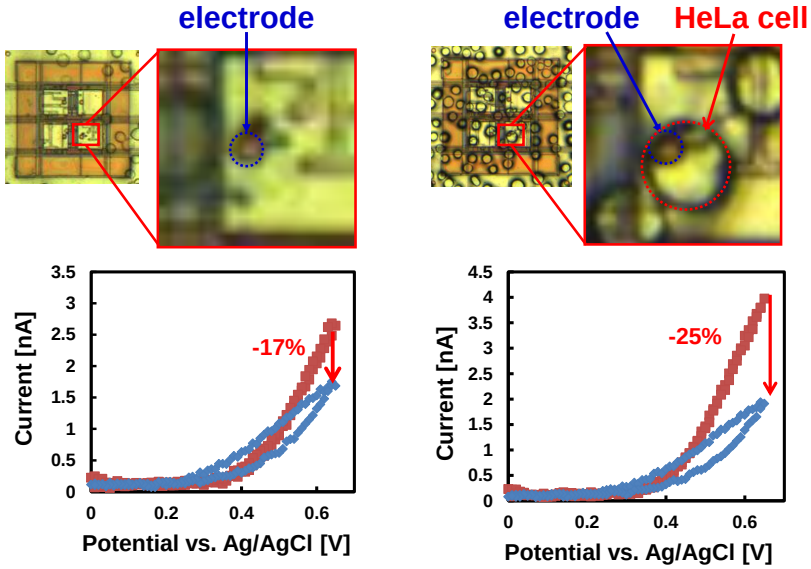
H. Ishihara, K. Niitsu, and K. Nakazato, SSDM2014

Application III

counting bacterium / virus





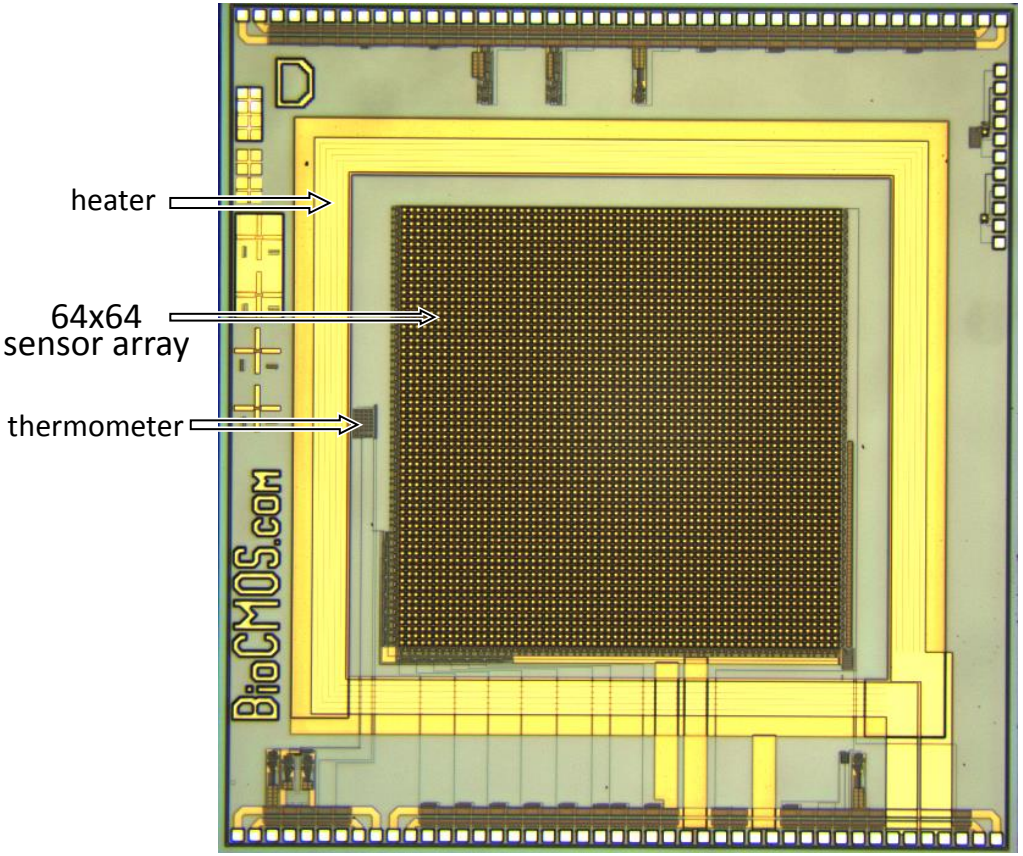


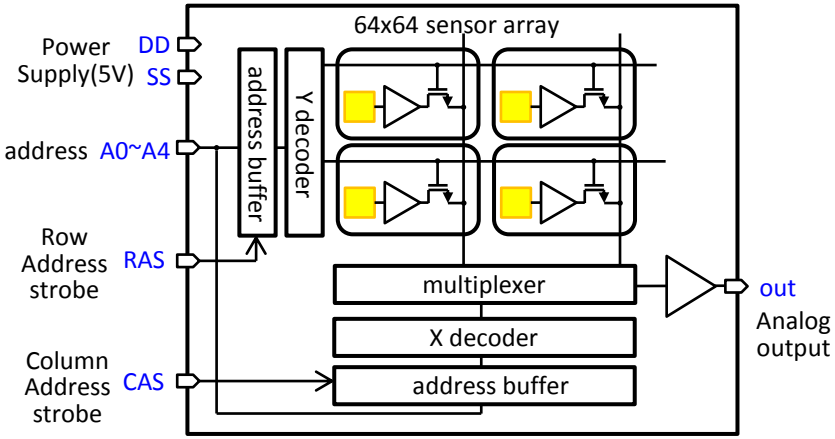
Electrode without HeLa cell

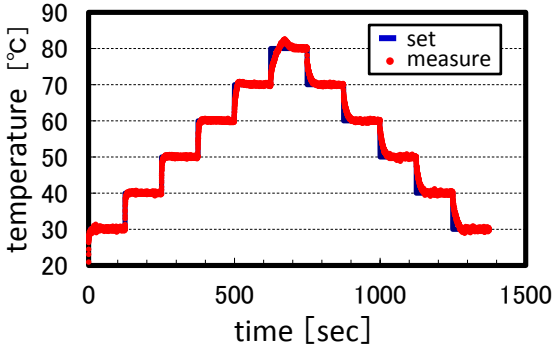
Electrode with HeLa cell

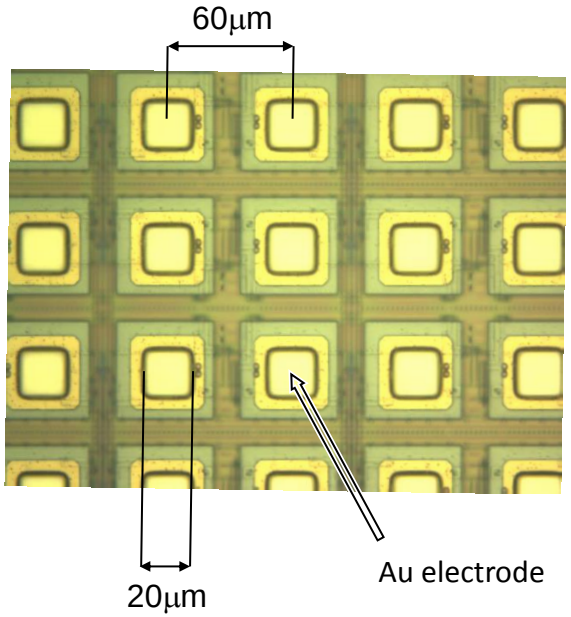
S. Ota, K. Niitsu, H. Kondo, M. Hori, and K. Nakazato, BIOCAS2014

64x64 potentiometric sensor array with temperature control

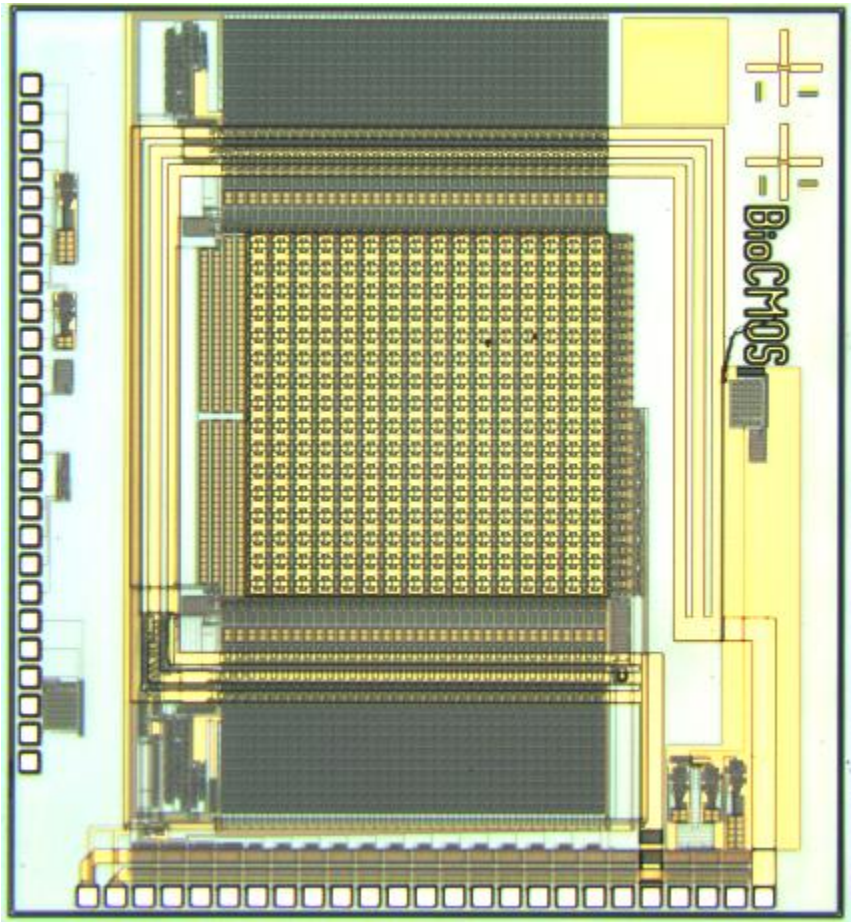


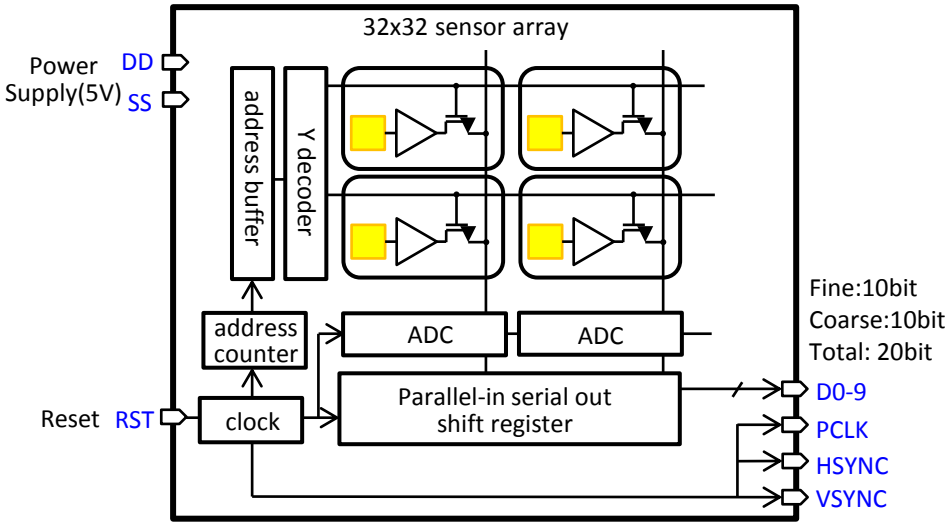


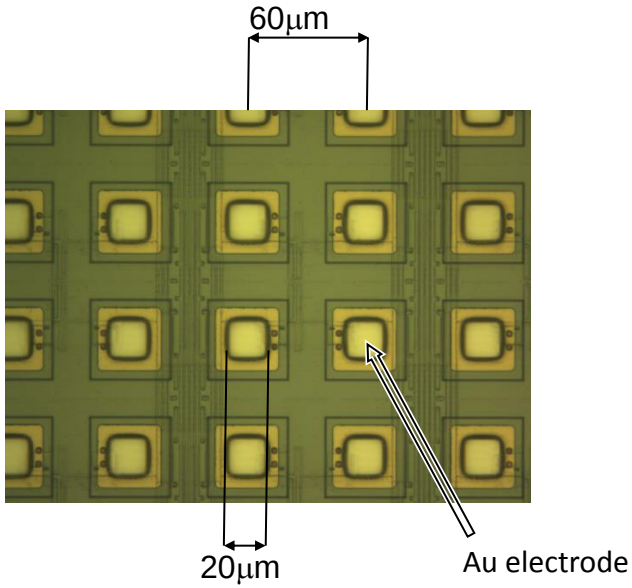
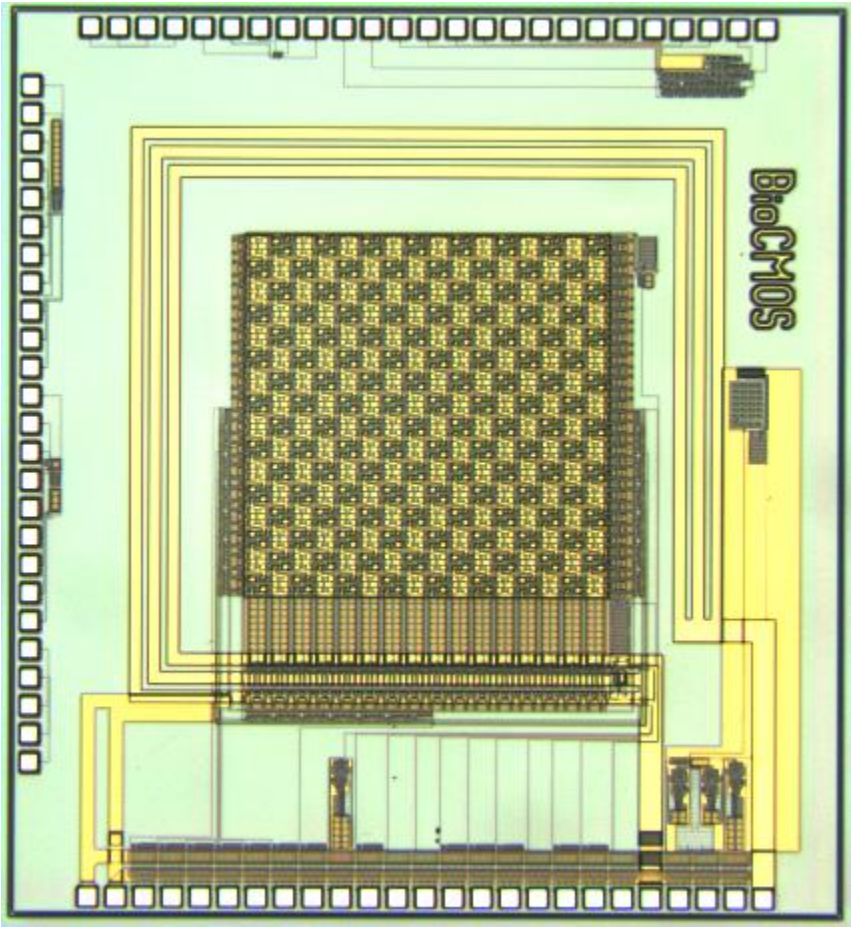
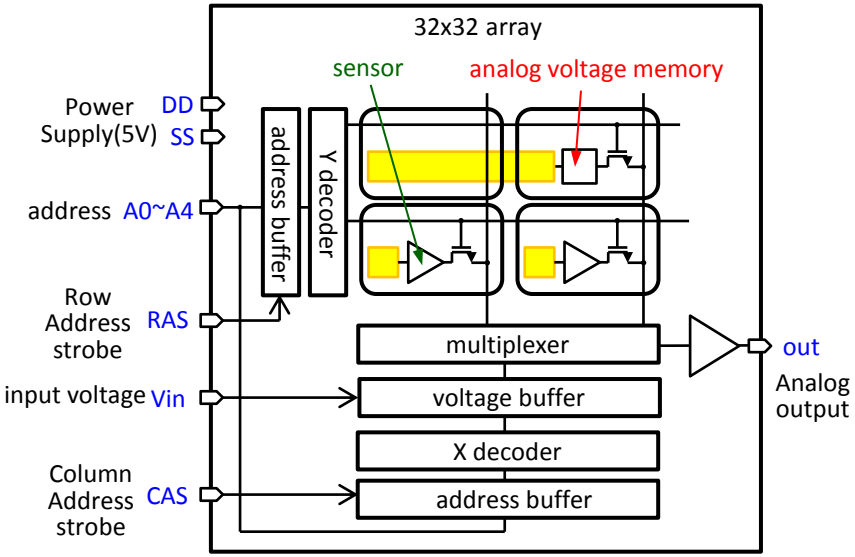
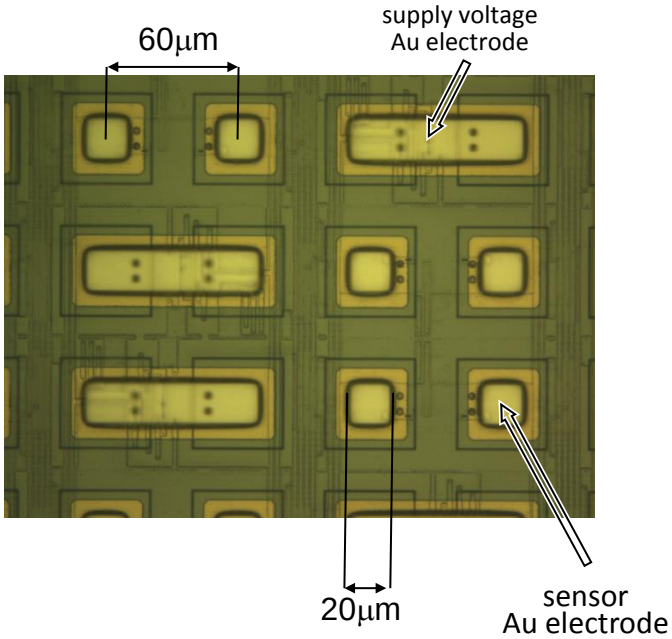




32x32 potentiometric/amperometric/impedimetric sensor array with temperature control







32x32 potentiometric/amperometric/impedimetric sensor l sensor array with electrophoretic control & temperature control