

SPATIALLY ARRANGED MICROELECTRODES USING WIRE BONDING TECHNOLOGY

FOR SPATIALLY DISTRIBUTED CHEMICAL INFORMATION ACQUISITION

Abstract

This poster presents **spatially arranged microelectrodes** to allow real-time monitoring of behavior of spatially distributed chemicals. Out-of-plane microelectrodes standing on a substrate with gradation in height are developed for the purpose. **Wire-bonding-based probe technology** makes it possible to provide spatially arranged microelectrodes. The wire-bonding-based probe technology combines wire bonding and laser machining. Bonded metal wires are converted to probe arrays by cutting the bridge. Spatially arranged microelectrodes can detect **spatially distributed chemicals in real time** would understand various phenomena caused by spatially distributed chemicals.

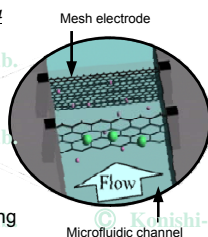
Spatially Electrochemical Sensor

Previous work

MEMS2007 pp.271-274

Gate type electrochemical sensor

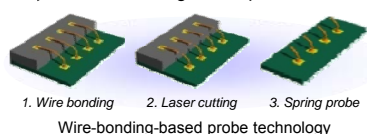
- 3 - D carbonized polymer mesh electrode
- Conductive structures through pyrolysis
- Integration of 3 - D mesh electrode & microfluidic channel
- Improvement of non-uniform flow sensing



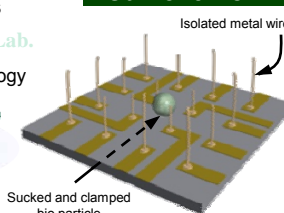
Isolated electrode

Spatially arranged microelectrodes

- Isolated out-of-plane microelectrodes
- Wire-bonding-based probe technology



Current work

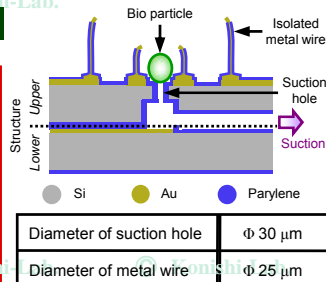


Spatially Arranged Microelectrodes

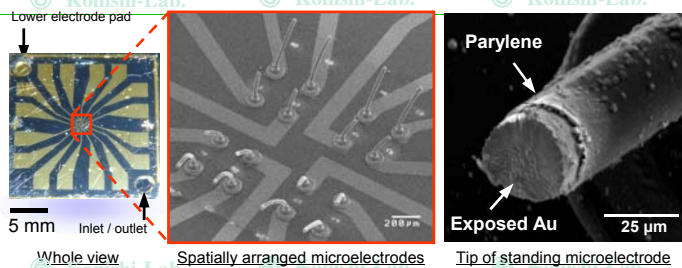
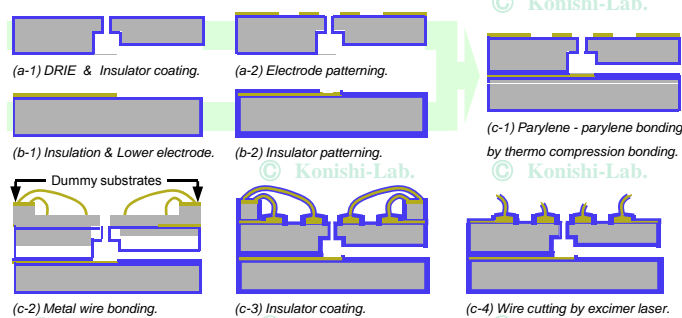
Structure & Specification

Advantages

- Isolated 4 x 4 (16) metal wires
- Wire bonding & Laser machining
- Various heights of out - of - plane microelectrodes
- Self - aligned measurements
- Sucked and clamped bio particle & Spatially arranged microelectrodes

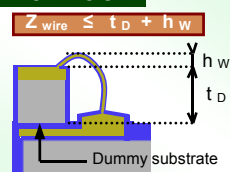


Fabrication process & results

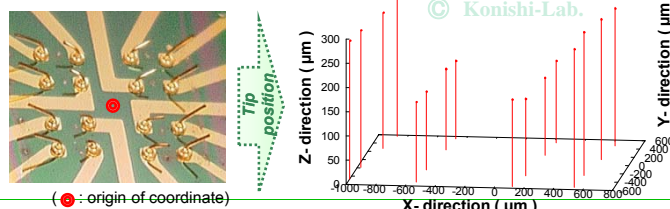
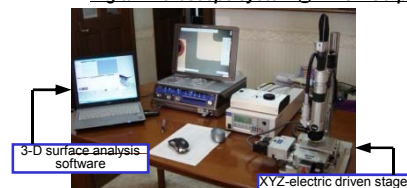


3 - D Position Coordinates

Definition



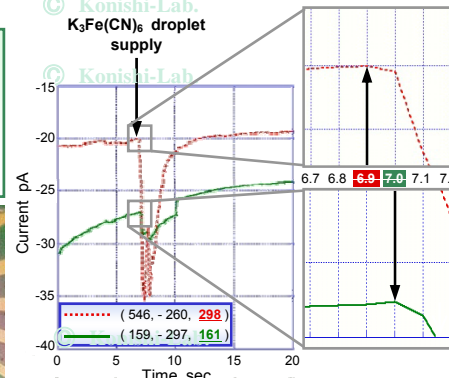
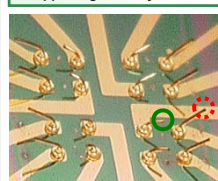
Digital microscope system @ HiROX Corp.



Electrochemical Sensing

Conditions

- Chronoamperometry
- Dual measurements
- Working electrode
- Standing microelectrode
- Counter electrode --- Pt
- Reference electrode --- Ag/AgCl
- Electrolyte --- K₃Fe(CN)₆
- Supporting electrolyte --- KNO₃



More quick response to the droplet of K₃Fe(CN)₆ could be observed at (546, -260, 298) near the drop point.

Summary

Novel spatially 16 arranged microelectrodes to allow real-time monitoring of behavior of spatially distributed chemical is described in this poster. Wire-bonding-based probe technology makes it possible to provide out-of-plane arranged microelectrodes. Further studies of developed spatially arranged microelectrodes are underway for high-throughput analysis of cellular respiration toward fertility treatment.