Microminiature super-fine ink-jet system

Micrometer order manufacturing technology is miniaturized to palm size

We have developed super-fine ink-jet (SIJ) technology which can eject a super fine droplet of 1/1000 in volume, compared with conventional home use ink-jet printer. Recently, microminiaturization of system size to 1/600 in volume is achieved. Furthermore, the system requires only DC5V, and can be operated on battery. By using this ultra-small SIJ units, micrometer scale patterning or precise material deposition in femt litter order is feasible. Mask-less patterning, such as micrometer scale circuit pattern can be achieved without a photolithograph process. It is a so-called portable palm-sized micro manufacturing system (Pocket factory). By brushing up more miniaturization and reliability, the palm sized system will be launched from an AIST start up company.

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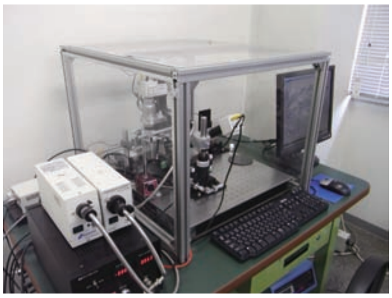

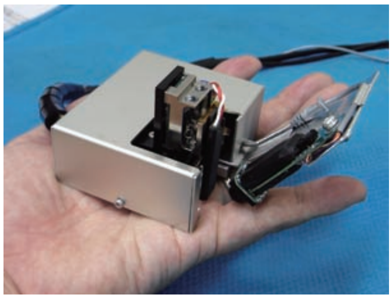

Left: Conventional super ink-jet system
Right: Newly developed palm-sized super ink-jet system

High sensitive sensor with good stability

Encapsulation of enzymes into nanoporous materials by controlling their pore sizes and conditions

We have developed encapsulation technologies of enzymes into nanoporous materials by controlling their pore sizes and conditions, and a novel detection method, based on the biosensors composed of an immobilized enzyme in the mesoporous silica materials, an electrochemical mediator (i.e., quinone) and an electrochemical cell, using the enzyme, i.e. formaldehyde dehydrogenase. These biosensors show rapid response and high sensitivity, which can detect 1.2 μM of formaldehyde in aqueous solution (corresponding to sub-ppb atmospheric concentration of formaldehyde). Furthermore, the sensors show high selectivity, reusability and remarkable storage stability (stable over 100 days), indicating formaldehyde dehydrogenase remains in highly ordered structure in these mesoporous silica materials. These results indicate that the mesoporous silica materials can provide favorable methods for enzyme immobilization on the electrode and then are useful for electrochemical biosensors with high performance.

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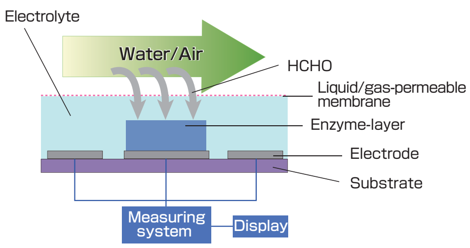
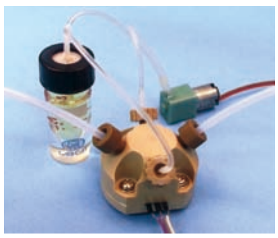
Sensor structure



External view



The sensor structure for the detection of formaldehyde