

# INTERNATIONAL MICROFLUIDICS CONGRESS

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## Hiroaki Suzuki

University of Tsukuba, Japan

### Adding new functions to microfluidic devices

Microfluidics has been used in diverse fields. Depending on the application, functions other than the simple transport of solutions, such as sensing and automatic processing of solutions, may be required. For this purpose, electrochemistry provides good solutions. Electrochemical sensors can be miniaturized by microfabrication techniques such as photolithography and screen-printing, which facilitate their coupling with microfluidic systems. Aiming for practical applications, we have already demonstrated devices for monitoring ammonia metabolism by hepatocytes, diagnosis of bovine subclinical mastitis, measurement of fish freshness, and measurement of the minimum inhibitory concentration of antibiotics. In some of these devices, we took full advantages of surface tension to realize processing of solution plugs separated with air, measure small solution volumes, stop solution plugs at

sensing sites, and merge two solution plugs in a single flow channel. In promoting the integration of microfluidic components on a chip, simplification of the structure and operation of the components are necessary. In this respect, simple micropumps and valves can be realized based on the production of bubbles by the electrolysis of water, electrowetting, and reductive desorption of a hydrophobic self-assembled monolayer. Basically, these components work by the application of a potential to the working electrode using an external potentiostat. The potential can also be controlled by changing the mixed potential using additional zinc electrodes and solutions in control flow channels. The control flow channels actually work as a program. By forming the zinc electrodes at appropriate locations in the control flow channels, timing to start pumping or open the switchable valves can be adjusted.

### Biography

Hiroaki Suzuki received his BE and ME degrees in applied physics and his PhD in bioelectronics and biotechnology from the University of Tokyo, Japan, in 1981, 1983, and 1993, respectively. Since 2004, he has been a full-time Professor at the Graduate School of Pure and Applied Sciences, University of Tsukuba. His current research interests include microfluidics, sensing devices based on electrochemistry, photonics, and plasmonics. Currently, he is a Fellow of the Royal Society of Chemistry and one of the editors of Sensors and Actuators B.

[hsuzuki@ims.tsukuba.ac.jp](mailto:hsuzuki@ims.tsukuba.ac.jp)