OMICS Group Conferences
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International Conference and Exhibition on
Biosensors & Bioelectronics

May 14-16, 2012 Embassy Suites Las Vegas, USA

# Metallization method on polymeric materials by electroplating method using supercritical CO2 toward application into bioelectronics

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The flexible and biocompatible properties of polymer make polymer MEMS promising candidates for the next generation of micro devices. Bio-medical micro devices such as micro blood checkers and strain gauges embedded into soft contact lenses are already envisioned. Even in neurodevices, the flexibility of polymer can provide strain relief against forces of micromotion between tissues and implanted devices. These properties are important for application in biosensor and bioelectronics. The best way to improve the quality of the metallization on polymers will be to develop a novel micro-fabrication technique for plating metal on polymer substrates. The most advantageous point of the electroless deposition method is that, in contrast to that of electroplating, it is possible to form the metal films on non-conductive substrate. Yet when working with micro dimensions, sub-micrometer pores with high aspect ratios must be efficiently filled. This capability of metal to impregnate into polymer can affect adhesion between metal and polymer. In this study, a novel technique for metallization on polymer by electroless plating method using a dense $CO_2$ beyond the critical point is proposed and discussed. Hybridized structures of polymer and metal were fabricated by a novel, hybrid technique consisting of two processes: catalyzation in supercritical $CO_2$ with palladium complex and electroless plating in emulsion with dense $CO_2$. This novel technique produces uniform metal structure with some excellent features of void-free, nodule-free metals and high adhesive strength. These good characters of the produced metal mainly come from two unique properties of supercritical $CO_2$. One is the ability to dissolve the hydrogen bubbles eluted from sub-reaction of electroless plating. Second is the transport property to penetrate the palladium complex catalyst and the electroless plating emulsion into polymer and induce the electroless plating reaction from deep part of polymer. This novel method is applicable to fabricate fine, hybrid structures of polymer and metal with high adhesion strength.

## Biography

Masato Sone has completed his doctor of engineering at the age of 28 years from Tokyo Institute of Technology. He worked for researcher in Nippon Oil Company from 1996-2000. He has studied for assistant professor and research associate professor in Tokyo University of Agriculture & Technology (2000-2005), and then for associate professor in Tokyo Institute of Technology (2005-2012). He has published more than 81 papers in reputed journals. His majorities are microelectronics, surface finishing, chemical engineering, liquid crystal and polymer science. His recent topic has been novel nano wiring process using supercritical carbon dioxide.

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