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### Novel approach to integrate biocompatible MEMS by electrode position using supercritical carbon dioxide

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The flexible properties of polymeric material make bio-MEMS promising candidates for the next generation of micro devices. However there have been many difficulties to overcome in fabrication process. Supercritical carbon dioxide (sc-CO<sub>2</sub>) is generally viewed as a replacement for harmful organic solvents used in extractions, separations, chemical reactions, molding, and many other applications because CO<sub>2</sub> is non-polar and the tunable physical properties between a gas and a liquid. Especially for application of sc-CO<sub>2</sub> in fine wiring technology, transfer of materials into and out of fine nano-space can be improved to allow proper cleaning and complete filling of the nano-spaces. Thus we have studied an application of sc-CO<sub>2</sub> into integration of bio-compatible MEMS. We examined sc-CO<sub>2</sub> for washing of photoresist pattern on substrate and completed washing the pattern with strengthening the adhesion. We have also proposed a washing process using emulsion of sc-CO<sub>2</sub> in water for eliminating the resist pattern from the substrate. We have studied metalizing of Ni-P on polyimide, which is composed of catalyzation process on/into polymer using sc-CO<sub>2</sub> of Pd-organic complex and electroless plating using sc-CO<sub>2</sub> emulsion (ELP-SCE), which is composed of an aqueous electrolyte, sc-CO<sub>2</sub>, and a surfactant. ELP-SCE enabled the penetration of Ni-P into deep-inside of polymer. We have studied electroplating method using sc-CO<sub>2</sub> emulsion (EP-SCE). Metal film obtained by this technique was uniform and without pinhole, because sc-CO<sub>2</sub> has low viscosity and compatibility of hydrogen. We demonstrate complete filling of 60 nm diameter holes with aspect-ratio of 5 on Si substrate by application of EP-SCE.

#### Biography

Masato Sone completed his Doctor's degree of Engineering at the age of 28 years old at Tokyo Institute of Technology. He worked as a researcher in Nippon Oil Company from 1996-2000. He was an Assistant Professor and then a research Associate Professor at Tokyo University of Agriculture & Technology from 2000 to 2005, and he got the position of Associate Professor at Tokyo Institute of Technology from 2005 until present time. He has published more than 99 papers in various scientific 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 for integrated circuit technology.

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