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Green fabrication of micro/nano materials by migration phenomena

Migration phenomena of atoms and ions have been known as negative factors, resulting in the deterioration in the electronic devices through the formation of voids, hillocks, whiskers and dendrites. For instance, the electromigration (EM), stress-induced migration (SM) and Electrochemical Migration (ECM) are owing to driving forces of electron flow, mechanical stress gradient and electric field, respectively. EM forms voids and hillocks at the ends of cathode and anode in interconnect. SM generates hillocks and whiskers in the thin films and interconnects. ECM precipitates the dendrites with fractal shape in water and on the surface of electrode. These migrations have often been studied on Al, Sn and Cu elements which are widely used as interconnects in devices and several countermeasures were proposed to improve the reliability of devices. Recently, the fabrication techniques of micro/nano materials have been developed by applying the scientific knowledge obtained from the prevention researches. Micro/nano materials with shapes of wire, rod, tube and needle are promising materials for enhancing the device performance. The trial fabrication and synthesis techniques have been demonstrated to grow upcoming materials. In particular, our group has developed the fabrication techniques of micro/nano materials by using EM, SM and ECM. In this presentation, our trials of the fabrication techniques are reviewed for getting an insight into advanced fabrication and application of the materials.

Biography

Masumi Saka has received his Bachelor of Engineering degree in 1977 and his Doctor of Engineering degree in Mechanical Engineering in 1982, both from Tohoku University, Sendai, Japan. He became a Professor at Tohoku University in 1993. His research interests lie in the evaluation of materials system and the fabrication of metallic micro- and nano-materials. He is an Editor of a book entitled “Metallic Micro and Nano Materials”.

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