

# Materials Process Engineering Group

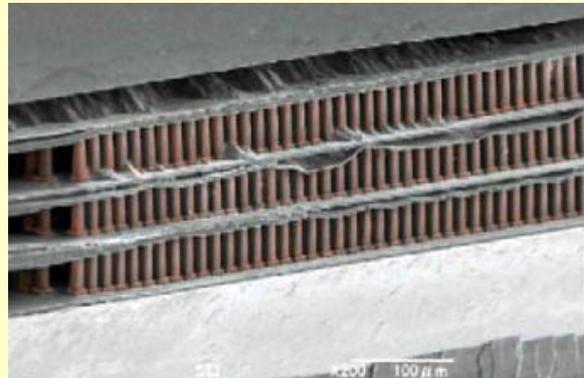
Professor Kazuo Kondo  
Associate Professor Takeyasu Saito  
Assistant Professor Naoki Okamoto

## Research Topics

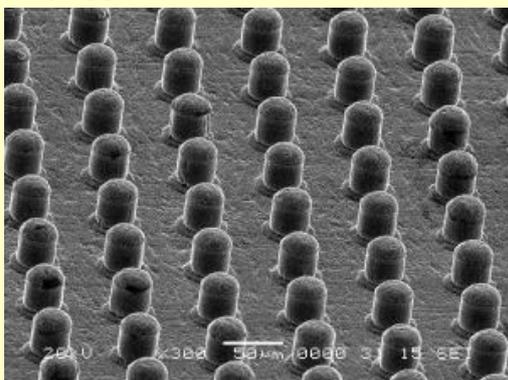
Material processing engineering is a field which specializes in researching manufacturing methods of various useful and functional materials including metals, semiconductors, ceramics. However, in order to use these materials in actual products, it is necessary to effectively manufacture the products so that they have properties suitable for their purposes, such as structure, electric resistance, film thickness, crystal quality. Therefore, of primary importance is considering the most appropriate conditions including temperature, pressure and concentration for each required property.

Many functional materials have been contrived from research based on silicon semiconductors; computer memory and microprocessors are the examples. Furthermore, the size of transistors has become extremely small, and recently the importance of new materials, processes and innovative packing technologies which had never been considered before has been increased. In order for the required function to be realized in extremely precise and complicated shapes, the research of material manufacturing processes based on scientific and engineering knowledge is essential.

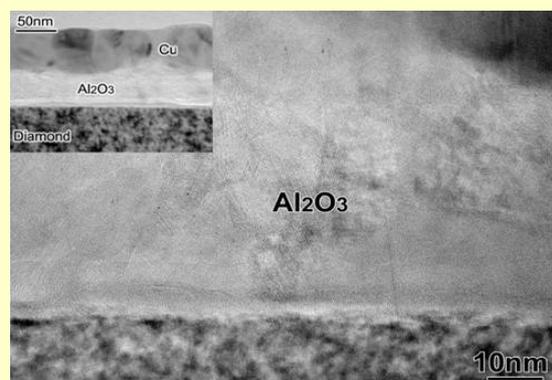
Our research group is conducting research concerning “microsize electroplating”. This is very important technology in advancing areas of engineering including fine connecting technology for liquid crystal displays, printed circuit boards, high density 3D packaging technology which uses copper through-hole electrodes, low-resistance wiring technology using copper and silver, micro machines. “Electrodeposition” is a method of depositing a solid substance based on electrochemistry, and it can be applied in various ways. Because of its applicability, there is a diversity of potential research surrounding this technology, including materials, manufacturing processes, monitoring methods, reaction engineering, environmental conservation, energy saving. Our research group is also proceeding with research on the processes of manufacturing both wide band gap materials for harsh environment application and ferroelectric materials for nonvolatile memory application.



SEM image of through silicon via (TSV)  
Cu wiring for 3-D package



SEM image of Cu core Pb free solder bump



TEM image of the gate structure of diamond FET