Focused Ion Beam (FIB) Technique

Focused Ion Beam (FIB) technology has become a widely used tool for microelectronics. A FIB system using liquid metal ion sources is capable of forming very small probes with high current densities. The ions strike the specimen to remove materials through a physical sputtering process.

A combination of a focused ion beam and a reactive gas also causes various physical effects on the specimen. Gas molecules above a specimen may be dissociated resulting in a local etching or deposition of the specimen. Based on these phenomena, the FIB system has been utilized in IC device modification, semiconductor process monitoring, failure analysis, micromachining, TEM sample preparation, etc.

Wafer process failure analysis and TEM sample preparation

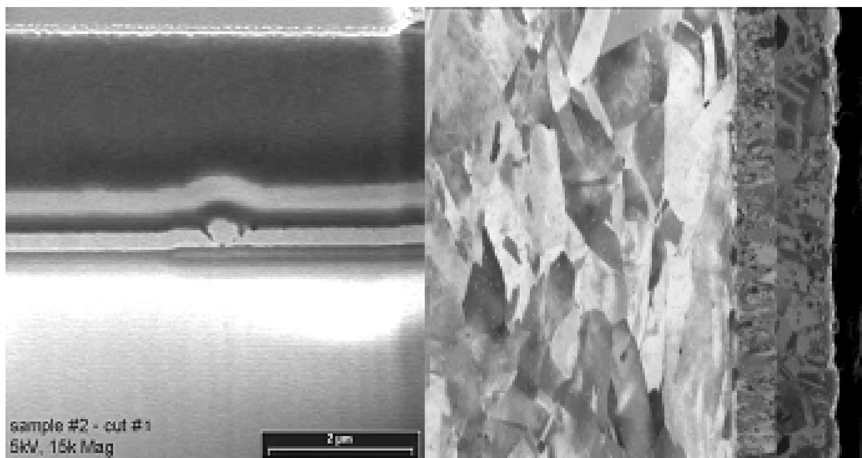
Failure analysis and sample preparation are becoming more and more difficult as the device structure becomes smaller and more complex. When the conventional FA sample preparation technique cannot meet the requirements of analyses, FIB becomes an essential technique. For failure analysis and process monitoring, FIB technique provides precision cross section at almost any locations and any angles with minimum contamination.

In conjunction with other FA techniques, such as SEM/EDX etc, this technique has become a powerful tool in diagnosing VLSI failure and process problems.

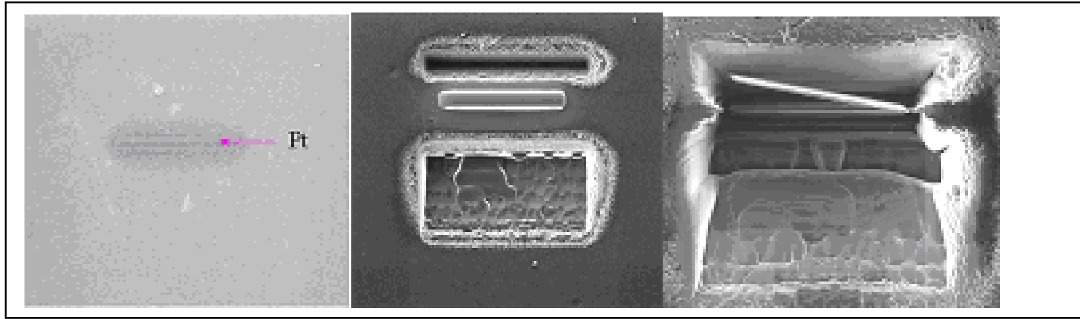
FIB technique has also become more important in TEM analysis of submicron technology devices by providing precision cross section TEM samples.

Device modification and micromachining

IC device design layout and logic errors traditionally have been evaluated using simulation returning Si process. Utilizing FIB "cut and patch" techniques, the evaluation process can be reduced by weeks or even months and with much less cost. A precisely directed Ga^+ ion beam reacts with chip surface and metallic precursor gasses to produce precise cut of conductive lines and deposit replacement interconnects. A working prototype incorporating the redesign can be produced in just few hours. Probing holes and isolation cuts allow full access for testing and failure analysis

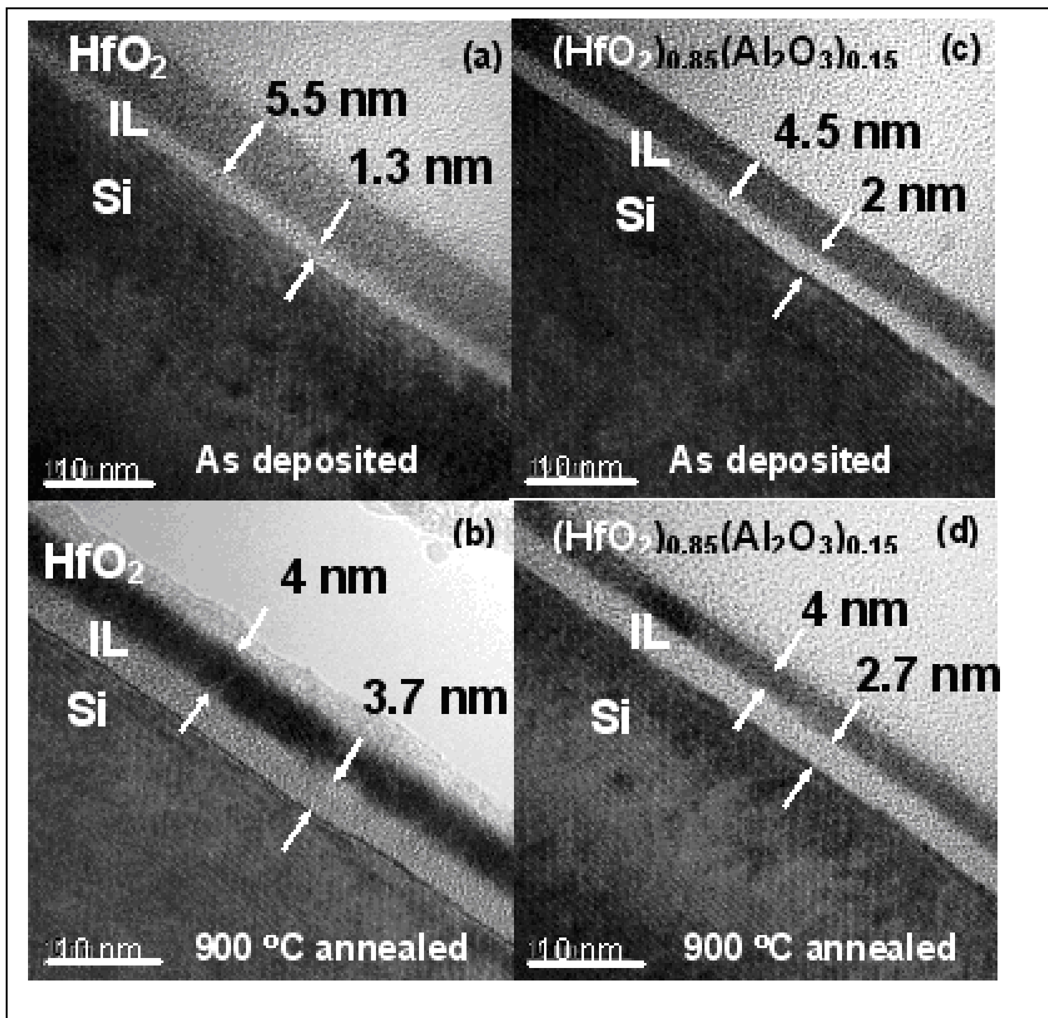


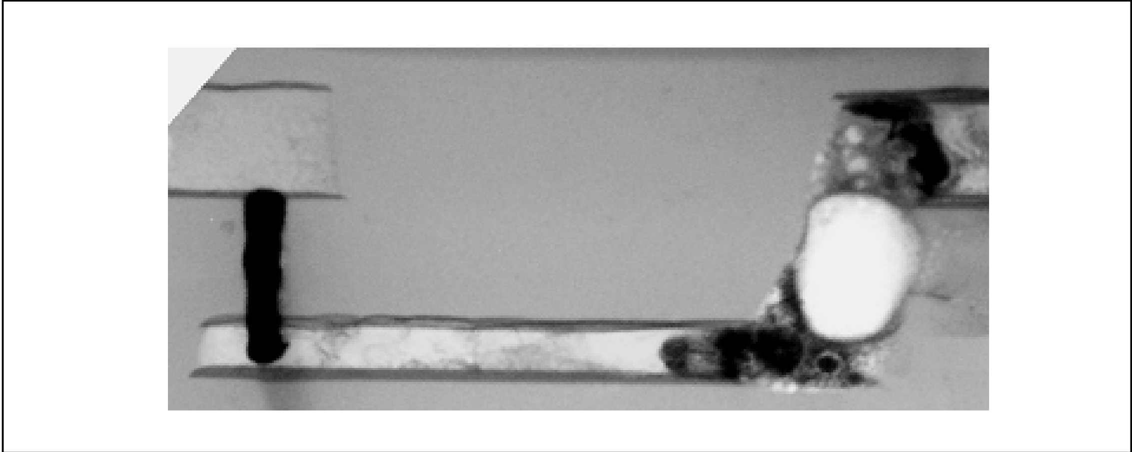
Fibbed micrograph of a particle   FIB micrograph for Grainsize



FIB lift out for TEM Specimen preparation

High K Gate dielectric microstructure evolution with temperature by XTEM .





XTEM picture of a typical EOS via failure