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Standardization of the Evaluation of SIMS Depth Resolution by a Standard Procedure and Multiple Delta-Layer Thin Films.

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In SIMS depth profiling analysis, the original distribution of constituent elements is seriously deformed by ion mixing, surface segregation and surface topography developed during sputtering. Therefore, the analysis capacity of depth resolution of SIMS instrument must be evaluated to get a depth profile close to the original one. Recently, an ISO standard procedure (ISO/DIS-20341) for the evaluation of SIMS depth resolution was suggested. In the standard procedure, Si-based multilayer thin films with very thin impurity marking layers were recommended as reference materials. Because the matrix effect and sputtering rate change can be minimized in the delta layer.[1]

Some Si-based multilayer thin films with delta-doped impurity marking layers were fabricated by ion beam sputter deposition as reference materials for the evaluation of SIMS depth resolution. The thickness of the standard specimen was measured by high resolution tunneling electron microscopy (HR-TEM), where the distance between the crystal planes can be a good internal standard for the measurement of the film thickness. The distance between the delta-layers was analyzed by SIMS.

Reference materials for the evaluation of SIMS depth resolution developed by KRISS will be summarized and some details for the development procedure will be introduced. Medium energy ion scattering (MEIS) analysis will show a good delta distribution of the As doped Si delta layer grown by ion beam sputtering with cracked hydrogen gas.

[1]. D.W.Moon, J.Y.Won, K.J.Kim, H.K.Kim, H.J.Kang, M.Petravic, Surf. Interface Anal. 29, 362 (2000).