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Composition and Structure Analysis of Ultrathin Films by Medium Energy Ion Scattering Spectroscopy

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MEIS has been successfully used to probe the composition and the structure of surfaces and interfaces. In this presentation, it will be discussed whether MEIS can be practically utilized for composition and structure analysis of ultrathin films rather than for surface analysis. To assess the analytical potentials and the practical limitations of MEIS as a thin film analysis tool rather than a surface analysis tool, a MEIS system constructed recently at Korea Research Institute of Standards and Science was used for analysis of 30 nm and 10 nm Ta₂O₅ thin films on Si, a Ta⁺ ion implanted Si (1×10^{15} ions/cm²), and a (10 nm SiO₂/ 10 nm Ta₂O₅) on Si with 100 keV H⁺, Ne⁺ and Li⁺ ions. Each ions have different kinematic factors, cross sections, electronic stopping powers as well as different charge exchange processes.

With the recent results, new and attractive features of MEIS for ultrathin film analysis as well as problems will be discussed regarding to the mass resolution, the detection limit, the depth resolution, the neutralization process, and the structural analysis.