

How much does the sputter-induced roughness affect the reduction of depth resolution ?

Isao Kojima, Toshiyuki Fujimoto and Natsuo Fukumoto

*Materials Characterization Laboratory, Department of Analytical Chemistry,
National Institute of Materials and Chemical Research
Highashi 1-1, Tsukuba Ibaraki 305*

The scanning tunneling microscopy (STM) and the atomic force microscopy (AFM) have been applied to study the relation between the surface roughness induced by ion sputtering and the depth resolution in Auger depth analysis. A Cr/Ni multilayer film was employed as a test sample. The surface roughness, Z_{80} , which was newly defined as the 10 to 90 % width of the frequency distribution of height, as well as the root mean square roughness, Z_{rms} , were evaluated from the STM and AFM data at various sputtered depths. Both the Z_{80} and Z_{rms} rapidly increased in the initial stage of sputtering (up to the depth of about 100 nm), and then, gradually increased to 200 nm depth. Z_{80} was found to be consistent well with the depth resolution, and thus *the vertical roughness accounted for most of the Auger depth resolution*. Oscillation of the surface roughness and the almost constant roughness above the depth of 200 nm were attributed to the slightly larger sputtering rate of Ni layer to that of Cr layer.

