A STUDY ON SIZE EFFECT OF ALUMINUM THIN FILM USING MICROBENDING TESTS

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Industrial application of materials at the micrometer and submicrometer scales requires accurate mechanical characterization. Also, a fundamental understanding of the deformation processes in micron scales is required to exploit the size effects to develop new and technologically functional materials. Resolutions of strain and load are important factors in the mechanical test of microstructures[1]. Because nanoindentater XP (MTS system Corp.) has very high resolution, many researchers used this equipment to investigate the micromechanics.

To evaluate the size effect of microstructure, we carried out the microbending test of aluminum thin film using nanoindenter XP. The shape of specimen is the bridge type beam with double simply supported boundary conditions. Aluminum thin film was deposited on the silicon wafer using the thermal evaporation. Aluminum thin film is patterned by conventional photolithography. At the end of the process, in order to make the bridge shape, silicon wafer was etched through the dry etching method of Xef_2 etcher.

The deformation at the micro-scale is dependent on the size of a specimen, some theories such as the couple stress theory and strain gradient theory in the literature are used to explain these phenomenon. In this research, we carried out the microbending test of bridge type specimen. From the experimental results, we evaluate the size effect of aluminum thin film in micro scale using some theories such as the couple stress theory and strain gradient theory.

References

[1] M. A. Haque and M. T.A. Saif, “A Review of MEMS-Based Microscale and Nanoscale Tensile and Bending testing,” Experimental Mechanics, Vol. 43, No. 3, pp. 248~255, 2003.

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