High throughput metrology of nanometric metallic thin films is of great interest to the microelectronics industry. Cu, for example, is used extensively as interconnect material while W has been identified as a potential next-generation substitute. Appropriate metrology methods must therefore be developed for structural characterization of these systems. X-ray scattering experiments are well suited for such investigations. For grain size and microstrain analysis, established line profile methods are discussed in terms of Cu and W thin film analysis. Grain sizes obtained by x-ray diffraction are compared to transmission electron microscopy based analyses. Significant discrepancies between x-ray and electron microscopy are attributed to sub-grain misorientations which are partially attributed to dislocation core spreading at the film/substrate interface. A novel "residual" full width half max parameter is introduced for examining the contribution of strain to x-ray peak broadening. The residual width is subsequently used to propose an empirical method of grain size analysis for thin films on substrates.

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The public is welcome to attend.