이온빔 집속장치에 의한 특정영역에서의 TEM 시편 제작방법

(Cross-sectional TEM Specimens Preparation of Precisely Selected Regions of Semiconductor Devices Using Focused Ion Beam Milling)

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As the lateral dimension and layer thickness of semiconductor device structure are continually being reduced, the detailed information on a submicron scale becomes increasingly important for process characterization and failure analysis. For that purpose, the cross - sectional transmission electron microscopy(TEM) is the most useful analytical technique with sufficient resolution.

The standard TEM specimens are usually formed by sandwiching a sample taken from the material under investigation in a support structure, and thinned by slicing, polishing and Ar^+ ion milling. Although the wide-spread introduction of conventional ion milling technique plays a big role in preparing the TEM specimen of complex devices, it requires repeated ion mill/observe cycles since the probability of obtaining TEM specimens at precisely selected regions of semiconductor devices is negligibly small.

A new technique using focused ion beam(FIB) milling has been developed for preparing the TEM specimens from prespecified location although it still has some shortcoming,i.e.,the specimens are strong wedge shaped, making it difficult to examine the wide vertical section of semiconductor devices.

In this contribution an attempt was made to overcome these problems by depositing in-situ W thin film on the specimen top surface to secure the TEM specimen to be less wedge shaped. Some TEM observations of various submicron contacts are illustrated.