

FIB preparation and STEM observation of specified area from two direction

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It is often difficult to find out and analyze a specific defective part of a semiconductor device by one directional thinning with an FIB instrument. Thus, it is necessary to find out a specific defective area in a preliminary processed thin film and to thin the film from orthogonal direction. Here, we report the result obtained by combining a specimen holder with a rotation mechanism and a bulk pick-up method [1].

A specimen holder (Tip-on Cartridge) was improved to provide with a tip mount which can be removed and rotated freely as shown in Fig.1. A specimen block prepared with the bulk pick-up method is fixed on the top of the tip mount and is processed with FIB and observed with TEM in two directions.

Practical procedures for specimen preparation and observation using this method are described as follows:

1. A block of approx. 20 μ m cubic including a point of interest is cut out from the specimen with FIB (Fig.2).
2. The specimen piece with the block is picked-up with a glass probe of a manipulator. Then, the specimen block is fixed on the tip mount (Fig.3).
3. A thin film for a plane observation is prepared from the specimen block fixed on the tip mount with FIB (Fig.4).
4. The thin film is observed from a plane view with TEM (Fig.5), and a position for a cross-sectional specimen preparation is found out.
5. The tip is rotated by 90 degrees. The thin film for a cross-sectional observation is prepared with FIB (Fig.6).
6. The thin film is observed from a cross-sectional view with TEM (Fig.7).

With this method, we can easily prepare a thin film of a defective part even if it is difficult to find out the position of an interested point by the one directional observation.

References

[1]N.Endo, T.Kuba, E.Okunishi, and T.Suzuki, *8th APEM*, (2004) 246-247

[2]T.Suzuki, N.Endo, E.Okunishi, and T.Kuba, *JEOL News*, 38(No.2) (2003) 82-86

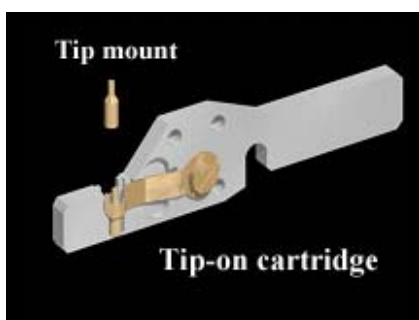


Fig.1 Special tip-on cartridge

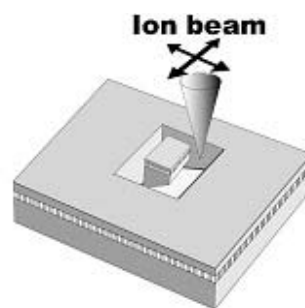


Fig.2 The specimen block cut out from a specimen

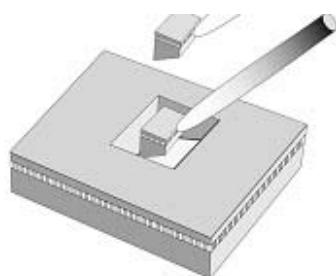


Fig.3a The specimen block picked-up with a glass probe



Fig.3b The specimen block on the tip mount

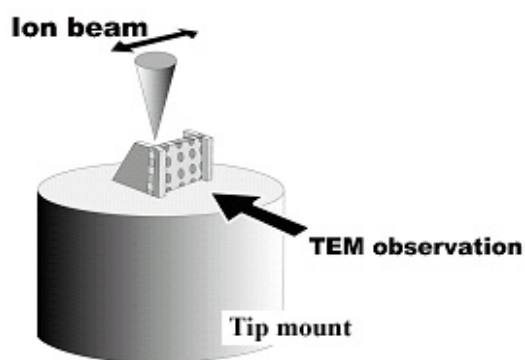


Fig.4 The thin film for a plan observation prepared from the specimen block

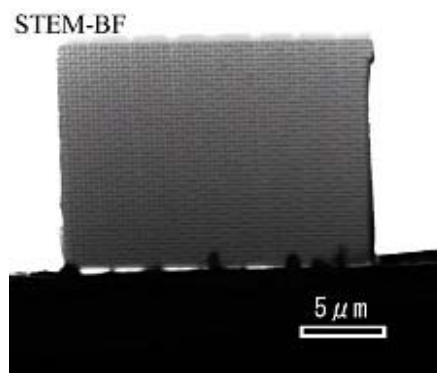


Fig.5 STEM-BF image from a plan view

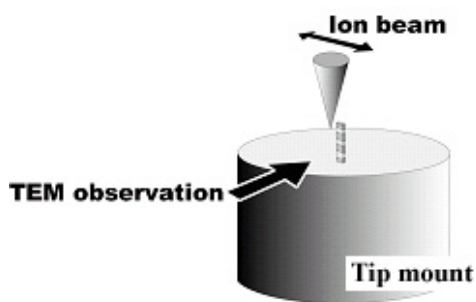


Fig.6 The thin film for a cross-sectional observation

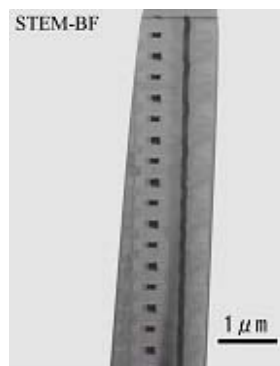


Fig.7 STEM-BF image from a cross-sectional view