

New Methods for Cross-Section Sample Preparation Using Broad Argon Ion Beam

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In 2006, we introduced a new specimen preparation apparatus, Cross-section Polisher (CP), which employs a broad argon ion beam to prepare cross-sections of specimens [1-2]. The principle of the CP is simple: a region of the specimen that is not covered by the masking plate is milled by an argon broad ion beam, as shown in Fig.1. The specimens with irregular shapes and rough surfaces that cannot be embedded prior to ion milling require additional care and consideration prior to ion-milling with CP.

We have developed a specimen rotation holder to prepare cross-sections of powders or specimens with circular cross-sections. The principle of the milling with the specimen rotation holder is shown in Fig.2. We mount a small amount of particle specimen that was mixed with thermosetting resin into a hole of the specimen rotation holder. Some volume of particle and resin mixture protruding over the hole will be milled and a high-quality cross-section of particles is obtained. Figs. 3a and 3b are a comparison of resulting cross-sections between the milling with a rotation holder and the standard milling with a masking plate. The resulting cross-section with a rotation holder does not have any artifacts of ion beam milling as compared to the standard mounting that shows some beam striations.

There is another group of specimens that cannot use a masking plate as the standard way of CP milling. Carbonless duplicating paper is one of them, which we cannot add physical pressure on to the surface by putting the masking plate. To make a cross-section of this sample, we put a piece of carbonless paper on a piece of silicon wafer. The specimen is milled through Si wafer first. Resulting cross-section of the paper was rather good and we can see the construction of the carbonless duplicating paper as shown in Figs. 4a and 4b. We will show application of this and other milling methods in the CP from variety of specimens.

References

- [1] K. Ogura, S. Asahina and N. Erdman, Proc. M&M, Chicago (2006)
- [2] K. Ogura, Proc. IMC 16, Sapporo, (2006) 1074

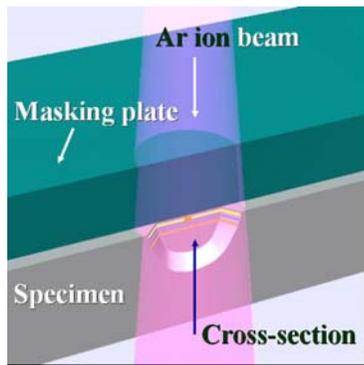


Fig.1. Principle of CP with a masking plate

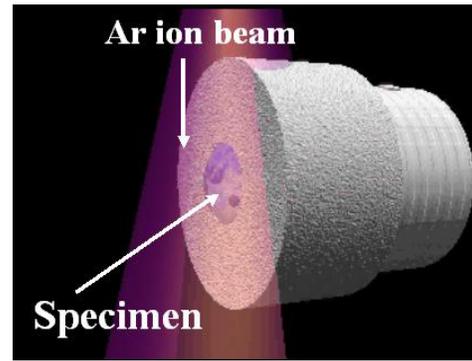


Fig.2. Specimen rotation holder of CP

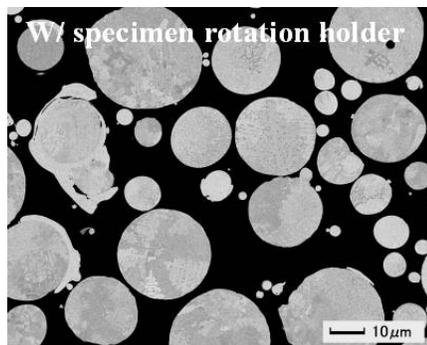


Fig.3a. Cross-section of metal powders with specimen rotation holder

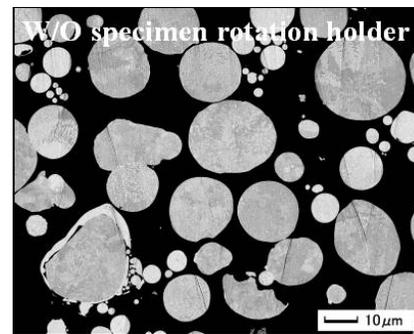


Fig.3b. Same as 3a but without specimen rotation holder

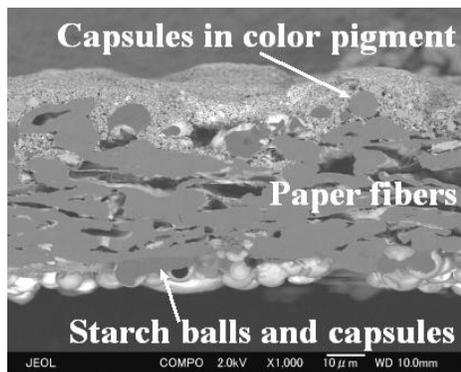


Fig.4a. Cross-section of carbonless duplicating paper (low mag.)

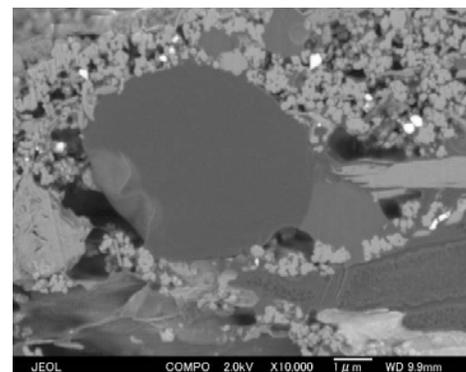


Fig.4b. High mag image of 4a.