

Type of presentation: Poster

**IT-10-P-2603 Analysis of bainitic transformation process in Cu-Al-Mn Alloy by using an orthogonally arranged FIB-SEM for precise 3D microstructure analysis**

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In order to investigate a 3D microstructure of complex materials precisely, we have developed an orthogonally-arranged FIB-SEM instrument which is specially designed to obtain a high-quality serial sectioning SEM image-set. The most characteristic point of this instrument is that the SEM and the FIB are arranged orthogonally. Fig. 1 shows the concept of this instrument. The advantages of this arrangement are that high-resolution and high-contrast SEM images can be obtained with low accelerating voltage such as less than 1kV because of the uniform background intensity and the short working distance (2mm). Furthermore, since the analytical instruments (EDS, EBSD and STEM, etc. ) can be located ideally , multiscale analyses can be performed in the single instrument. Fig. 2 shows the arrangement of apparatuses around a specimen viewed from the top along the SEM axis. We applied this technique on the analysis of the microstructure of bainite phase in non-ferrous noble metal based alloys. Bainitic transformation has both characteristics of a diffusionless and a diffusional transformation. Many studies on bainitic transformation have been conducted in various alloy systems such as steel, a noble metal (Cu, Ag, and Au) based alloy systems. However, the mechanism of the bainitic transformation has still been unclear. In this study, in order to reinvestigate the bainite in Cu-Al-Mn alloy, several samples with varying aging condition are prepared and observed by the orthogonally-arranged FIB-SEM and other recent SEM and TEM techniques. Fig. 3 show the SEM secondary electron (SE) image of the sample aged at 503K for 10 min. We can see some capillary binite precipitations. As a result of serial sectioning, however, it was revealed that the shape of bainite is plate-like crystal. The results of the analysis of the transformation process with these new techniques will be discussed.

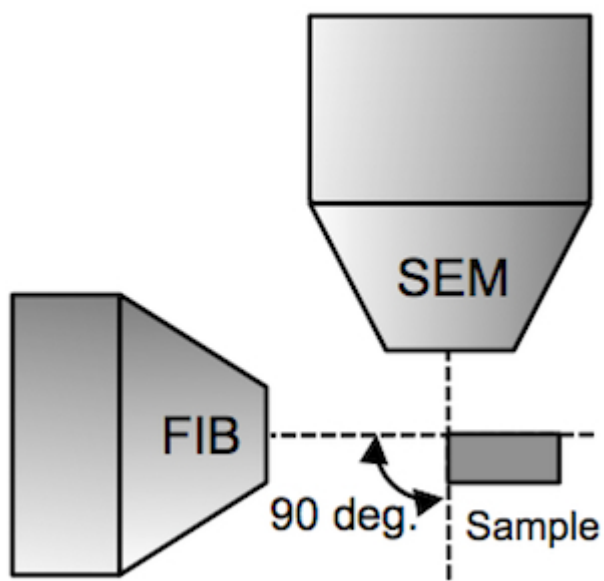


Fig. 1: Schematic illustration showing the configuration of the SEM and FIB in the orthogonally arranged system.

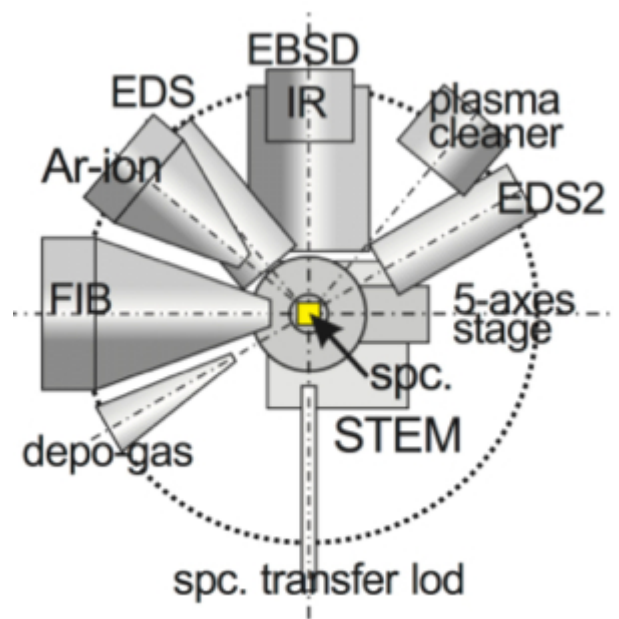


Fig. 2: Schematic illustration showing the arrangement of apparatuses around a specimen.

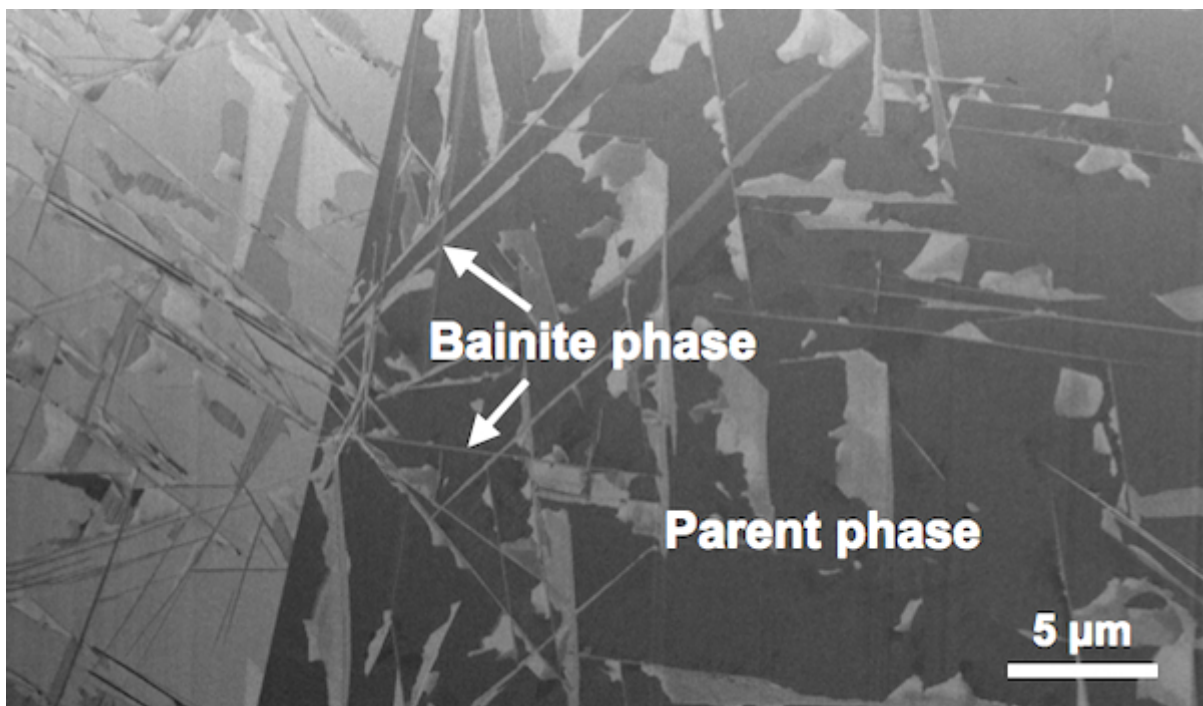


Fig. 3: SEM SE-image of Cu-Al-Mn alloy aged at 503K for 10 min sample.