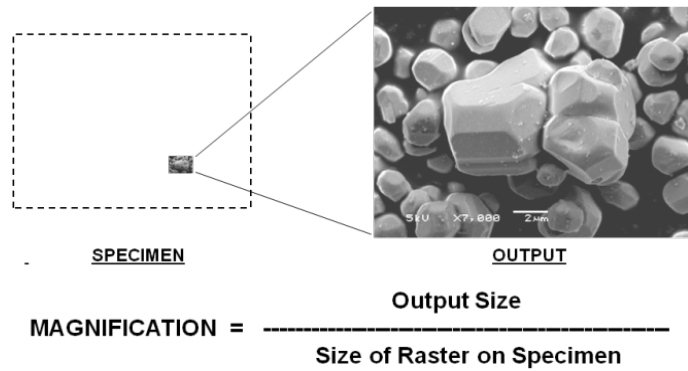


# A Note on Magnification

## JEOL Technical Note

Magnification is defined as the ratio of the size of the rastered area on the sample to the size of the rastered area of the output, as is shown in Figure 1. Traditionally, the output size was defined as a Polaroid 4x5 film size by all vendors and results were easy to compare. However, since images are now collected digitally and can be output at various sizes, this "output size" is ill-defined. SEM manufacturers can choose different output sizes for their images, making magnification a very deceptive number when comparing SEM micrographs from different SEM manufacturers. Because of this fact, the best way to compare images is to compare the length of the micron bar or field of view.



The SEM images of hematite from two different SEM manufacturers below illustrate this point. The left image is from a JEOL SEM and has a magnification labeled as 75,000 X with a 100 nm micron bar. The right image is from another SEM manufacturer and has a magnification labeled as 150,000 X with the exact same length 100 nm scale bar (highlighted in red). This shows that *the enlargement of the sample is identical* in the two images, even though the magnification value stated by the other SEM manufacturer is *twice* that of the JEOL image.

Figure 1: A small raster on the specimen leads to a large magnification for the same output size.

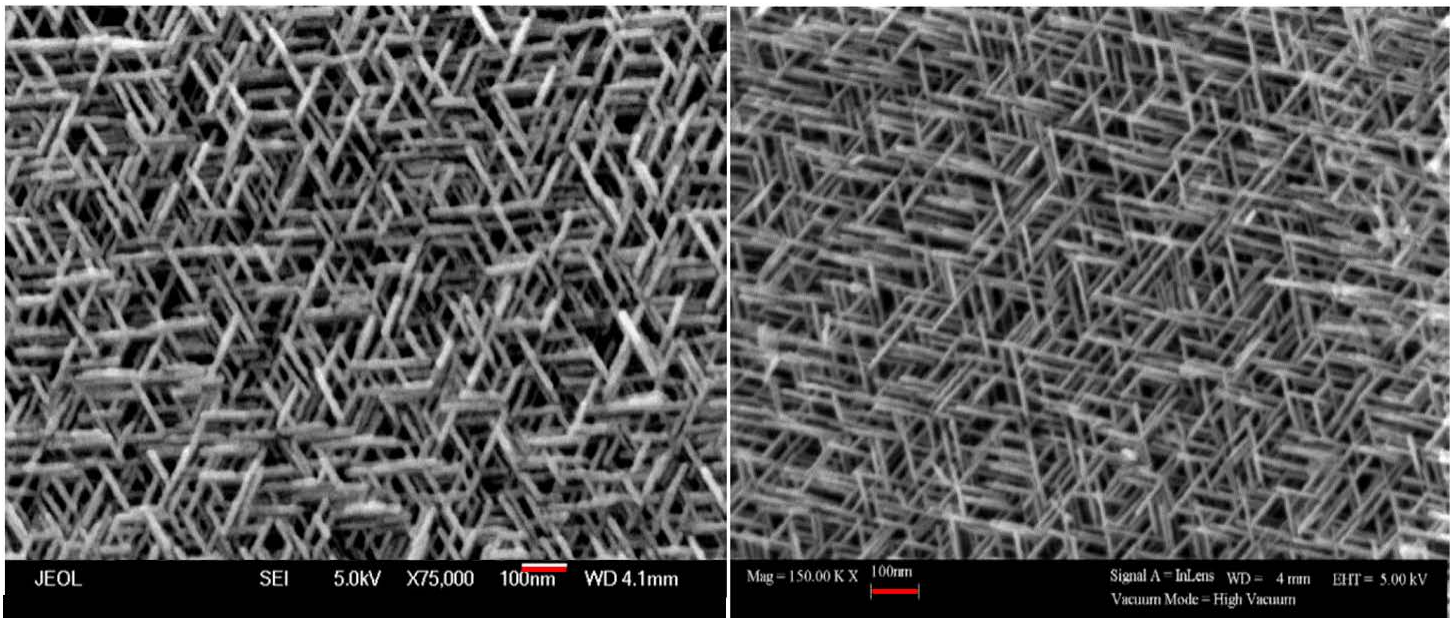


Figure 2: SEM images of hematite with the same enlargement of the sample despite having different magnification values stated. Left image: From a JEOL SEM Right image: From a different SEM manufacturer