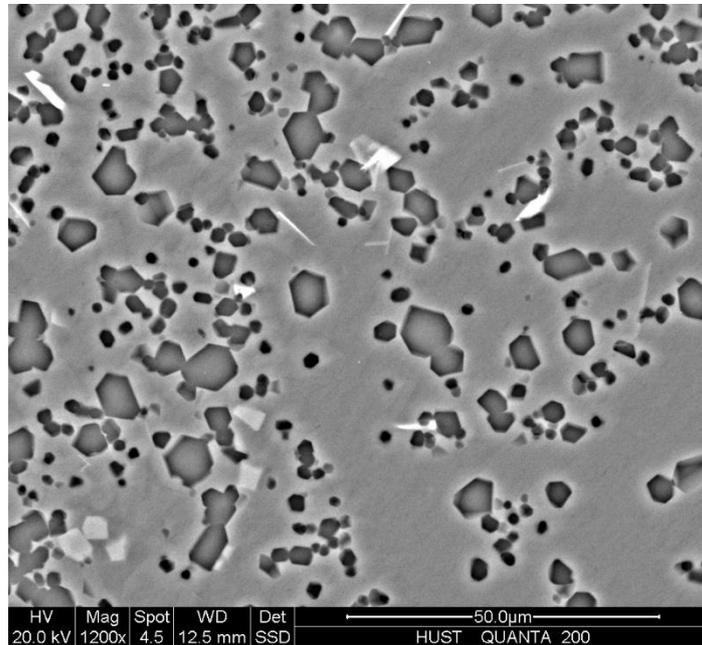


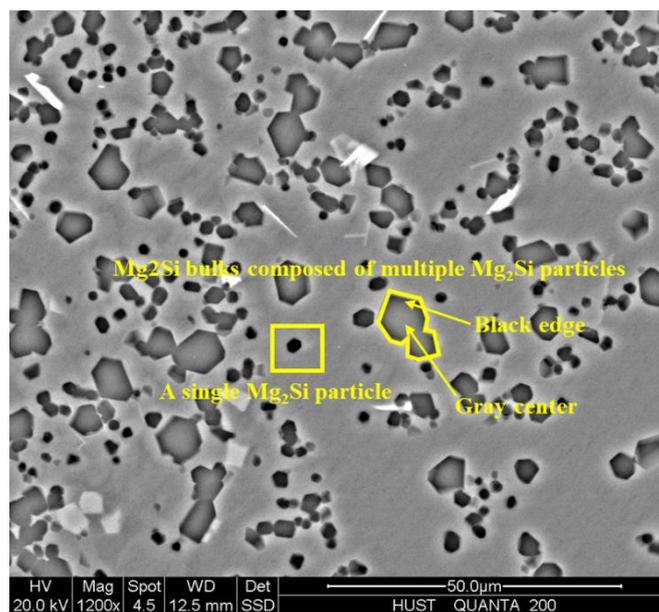
The size of the  $Mg_2Si$  at the Mg/Al interface, in two layers were measured by using the image-pro software. The process of using image-Pro to measure the size of  $Mg_2Si$  will be introduced below.

1. We need a clear SEM image that we can clearly see the outline of the  $Mg_2Si$  phase, such as Figure S1.



**Figure S1.** The original SEM image.

2. We need to set a standard for the measurement, as shown in Figure S2. We can divide  $Mg_2Si$  phase into two types: one is a single  $Mg_2Si$  particle, and the other is a large irregular  $Mg_2Si$  phase formed by the aggregation of multiple  $Mg_2Si$  particles. The bulk  $Mg_2Si$  phase formed by the aggregation of multiple  $Mg_2Si$  particles is regarded as one  $Mg_2Si$ .



**Figure S2.** The standard for the measurement.

- The large-sized  $Mg_2Si$  phase has a darker black edge and a lighter gray center, as shown in Figure S2, which is inconvenient to extract the outline of the  $Mg_2Si$  phase during the measurement. Therefore, we used photoshop to adjust the color of these areas for the subsequent measurement. In addition, other areas in the image that would affect the identification of the  $Mg_2Si$  phase also need to be processed. The processed image is shown in Figure S3.

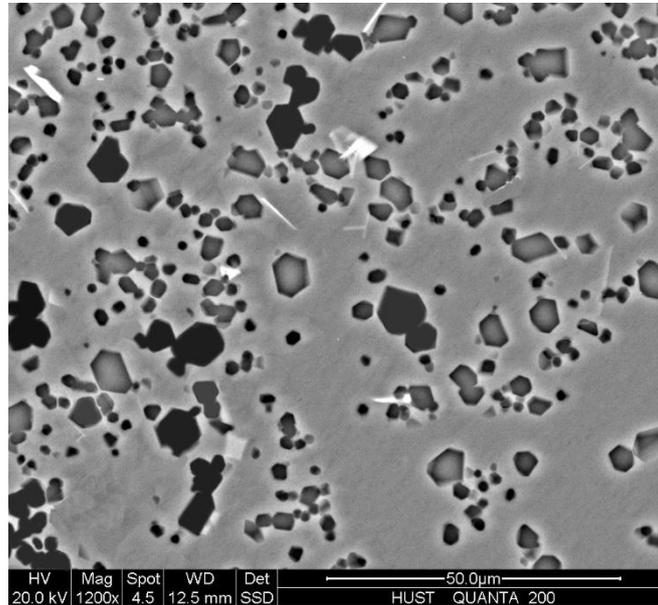


Figure S3. The processed image used for measurement.

- Space calibration is performed prior to measurement, according to the ruler of the picture.

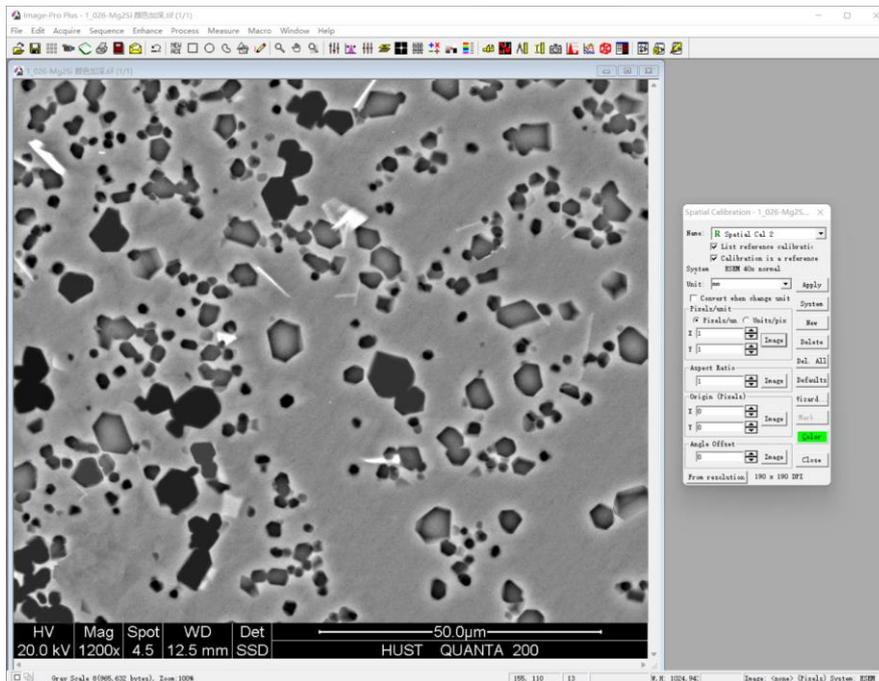


Figure S4. Space calibration

5. Select the area to be measured.

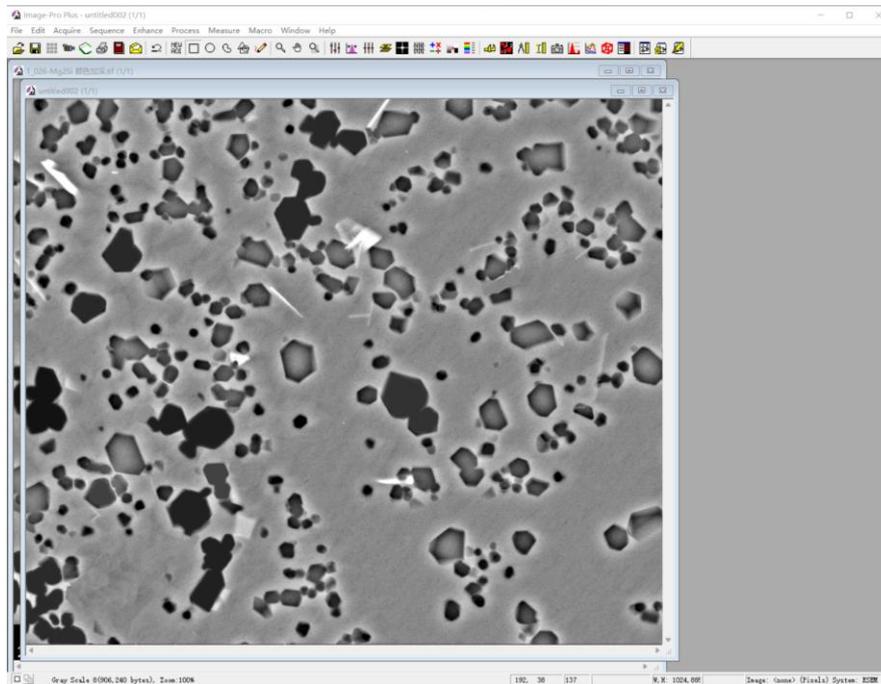


Figure S5. Select the area to be measured.

6. Using the “perform segmentation” function, shown in Figure S6, to convert images to black and white image, as shown in Figure S7.

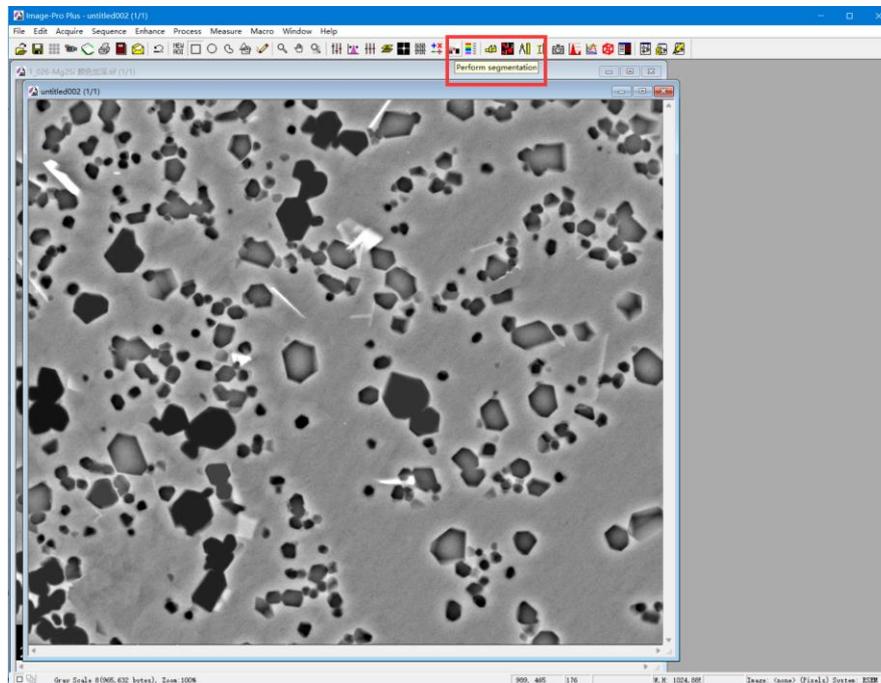


Figure S6. Using the “perform segmentation” function to convert images to black and white image.

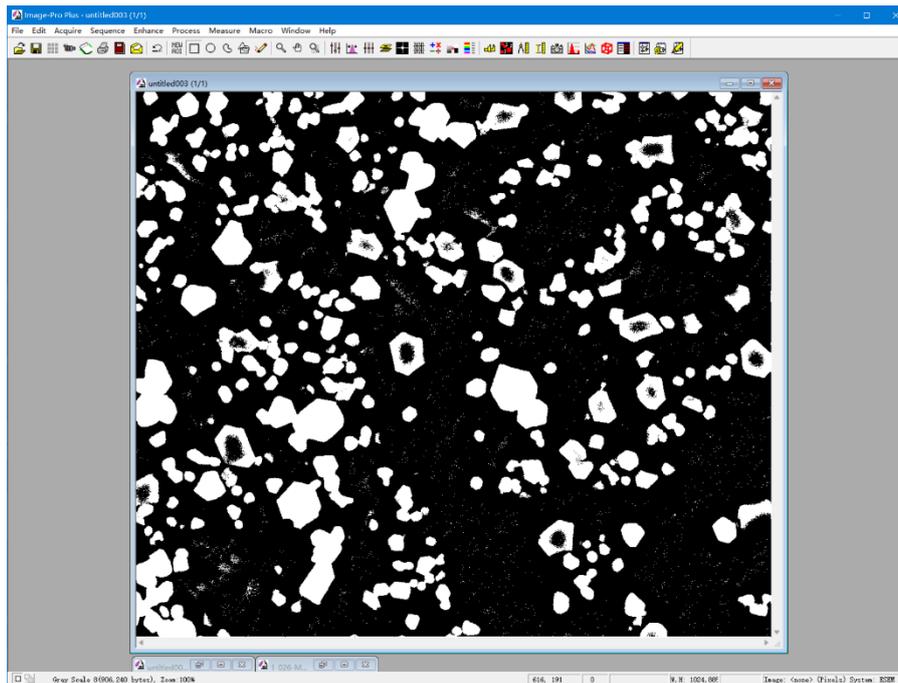


Figure S7. The black and white image

- Using the “Count and measure objects” function, shown in Figure S6, to measure the size of the Mg<sub>2</sub>Si phase.

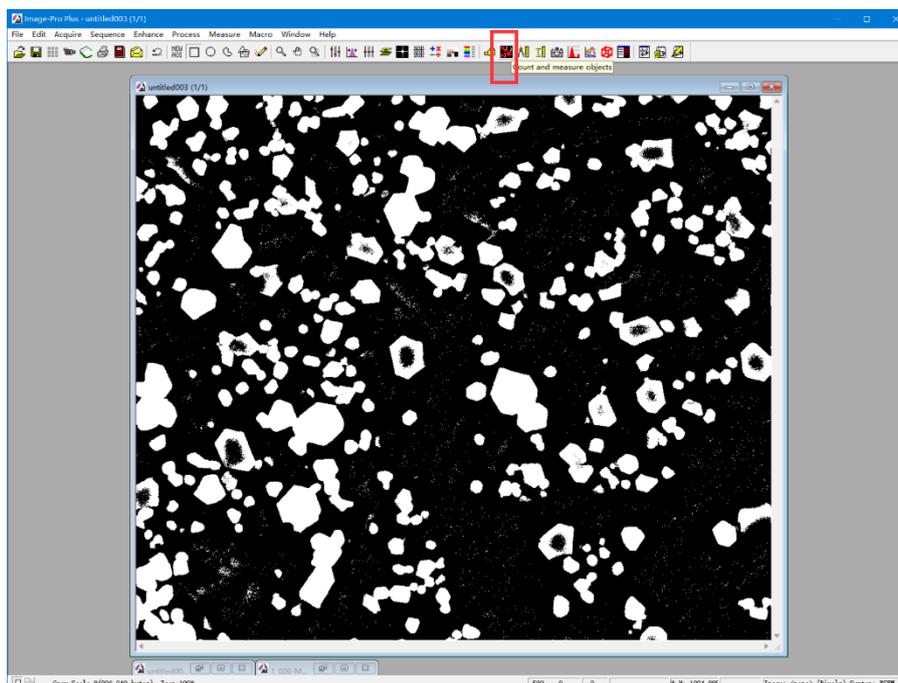


Figure S8. Click on the “Count and measure objects” option.

- Click on the “Select Measurements” option shown in Figure S9, to select the value that you want to measure, as shown in Figure S10. During measurement process, you can set a threshold below which measurements will not be included in the final statistics. Then, you can manually delete the measurement results that do not belong to the Mg<sub>2</sub>Si phase by comparing with the original SEM pictures. Finally,

you obtain the area of the Mg<sub>2</sub>Si phase, as shown in Figure S11. By equating the area of the Mg<sub>2</sub>Si phase to a circle, the diameter of the corresponding circle is calculated as the size of the Mg<sub>2</sub>Si phase.

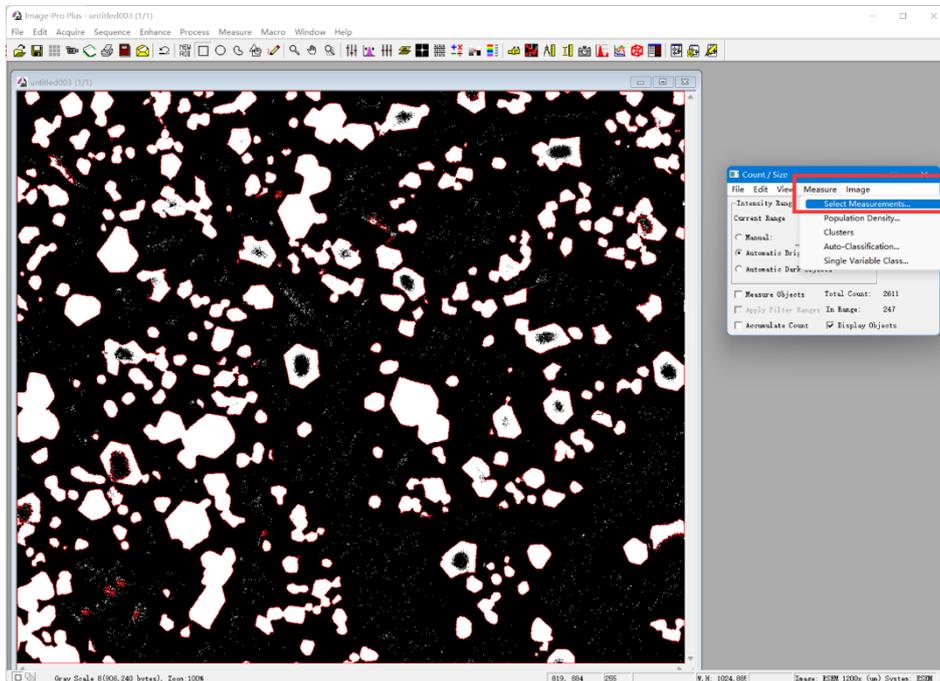


Figure S9. Click on the “Select Measurements” option.

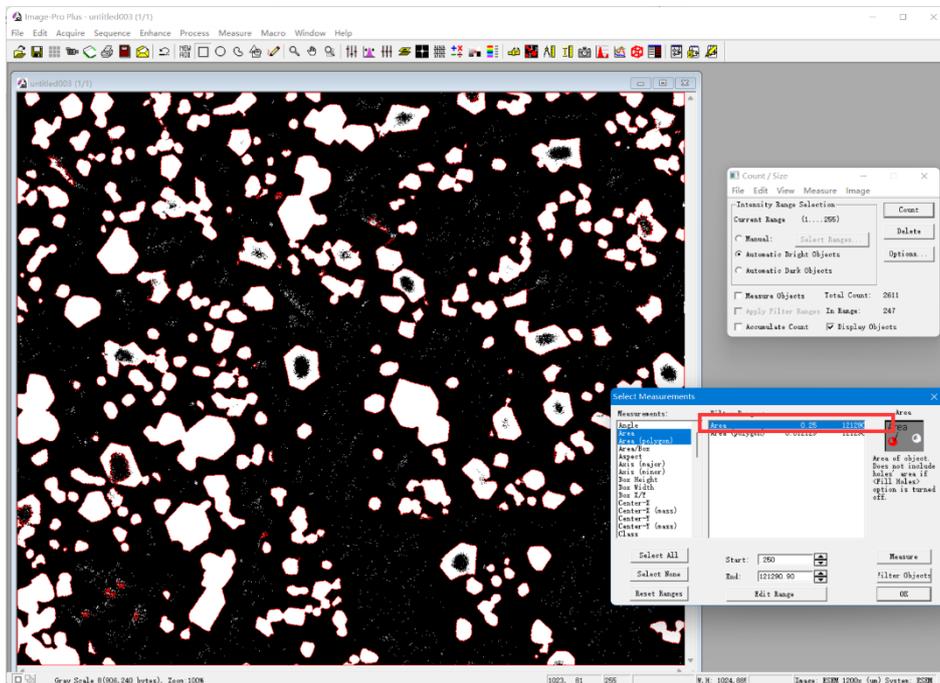


Figure S10. Setup the measurement options.

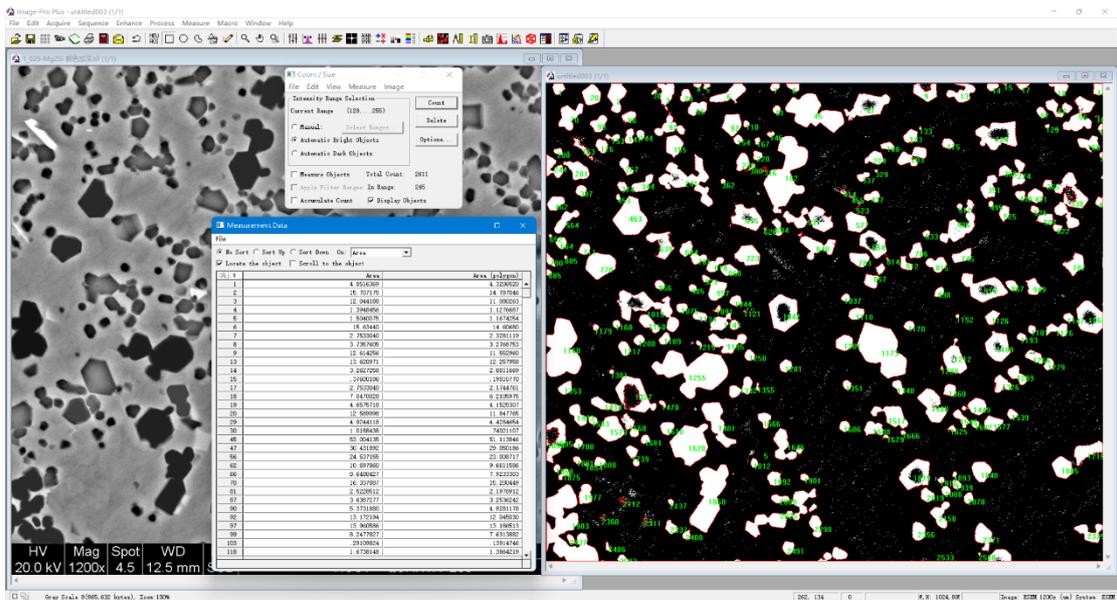


Figure S11. Measurement results.