Enhancement of SEM images

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Abstract: - SEM depicts the surfaces of the materials which are consisting of peaks and valleys. Due to their shapes, the surface of the SEM image is not linearly illuminated. A solution is required to this issue. Therefore, an image enhancement algorithm which enhances the visibility of details content in SEM images is presented. The algorithm consists of the following imaging filters: shock filter, image sharpening, homomorphic filter, contrast stretch. The benefits of applying this algorithm are illustrated by showing a set of demonstrative images of the SEM original images and their enhanced visibility images, respectively.

Result of simulations

An image processing algorithm improves original SEM images. As a result of applying this image processing algorithm, in the SEM processed image the contrast enhances. Thus, fine details become distinguishable. The algorithm consists of the following four filters:

1. shock filter to enhance the contrast of the image
2. sharpening filter to diminish the image blur without affecting fine details and edges,
3. homomorphic filter to correct the non-uniform illumination of the images,
4. image quality enhancement in terms of contrast and brightness.
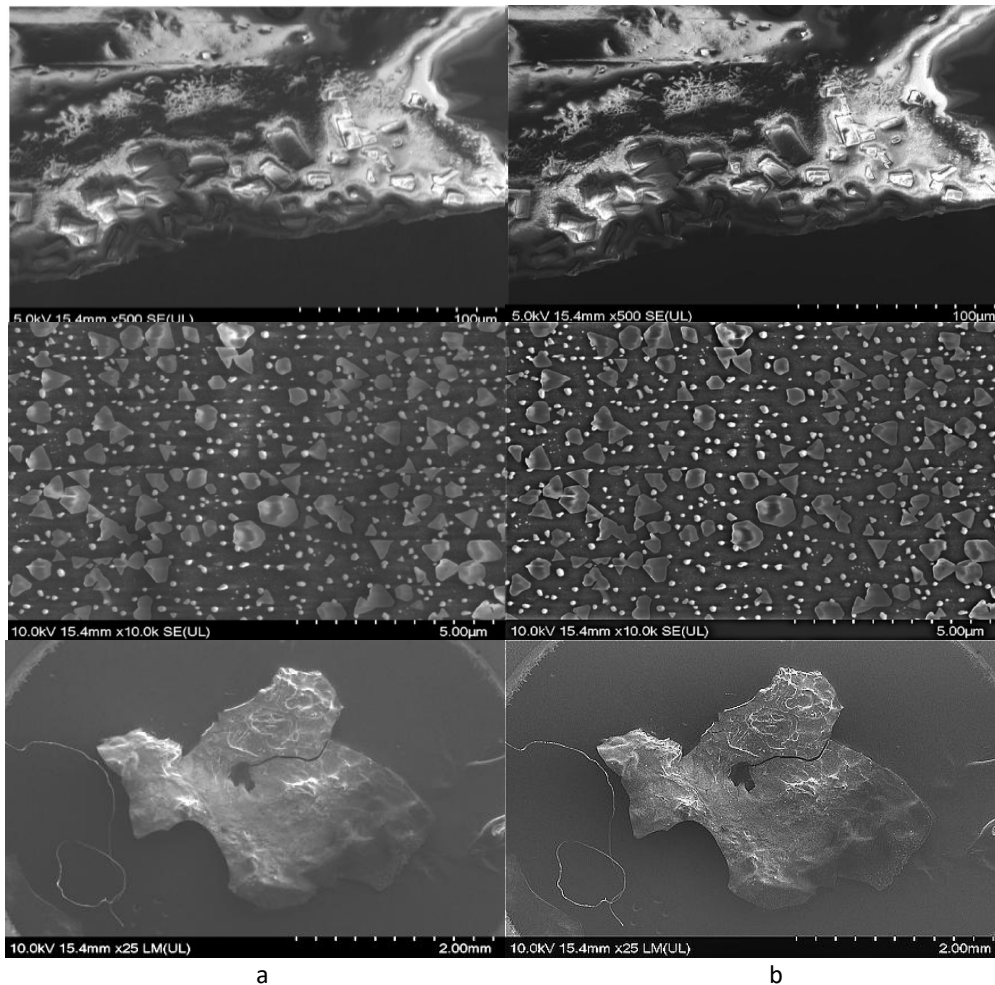

a   b
Fig. 1 a) Input images having x25, x500 and x10 k zoom, b) equivalent output quality enhanced images.

Conclusions

The imaging processing algorithm uses a set of four filters which remove the blur and enhance the contrast of the original SEM image. Clearer visualization of the SEM images allows identifying the surfaces of the materials. A set of demonstrative images proves the operation of the algorithm.

Reference

[1] F. Toadere, N. Tosa "Enhancement of the raw OCT image quality," AIP Conference Proceedings 2206, 040002, (2020)