

## **Code to run: MainCode\_AggAnalysis.m**

### **Introduction**

This program is used to analyze results from TEM images of soot particles. The results of the processing will be written in the "Output" folder.

### **How to use**

To use the program, open it in MATLAB and run it. The program will then prompt the user to select the desired image(s) to be analyzed. Selecting only one image is recommended. After the user selects the image(s), the program will ask where the TEM image was taken. This allows the program to be able to determine the magnification. If taken at UBC, the program can detect the magnification automatically. If taken somewhere else, the user will then be prompted to select two points corresponding to the ends of the magnification bar as well as enter in the distance the magnification bar represents.

The user will now be prompted to crop the image. The user should crop out the image footer but not crop too close to the aggregate as some of the background will be needed for later processing. To crop, the user must adjust the rectangle and then double click to complete the crop.

The program now asks the user which type of particle is to be analyzed. If the image contains multiple particles they will each need to be processed individually. The types are:

1. Aggregate: for all particles composed of multiple primary particles
2. Aggregate (dp measurement only): for particles composed of multiple primary particle but for which the aggregate size does not or cannot be measured (for example if only half of the particle was captured in the image)
3. Single primary particle: a particle consisting of only one primary particle

Only for particle type 1 (Aggregate) the user will now use the lasso tool to trace loosely around the edges of the aggregate. Then, a threshold level bar adjuster will appear and the user will need to adjust it in order to have the aggregate be black but not touching any of the background noise. Then the user clicks continue to move on. The user will now be shown what the outline looks like and can left click on any particles not belonging to the aggregate outline. To continue, the user should right click. The user will then be shown the new outline and will have the option to redo the manual edge process or to move on. Once the user moves on they will be asked whether or not they would like to measure the primary particle size. If 'no' is selected the program end here. If 'yes' is selected, the program then moves on to the primary particle sizing.

Primary particle sizing is for particle types 1, 2 and 3, though for single primary particles there will only be one to measure. The user will be told to crop the image. The image should be cropped relatively close to the particle in order to be able to better see the primary particles. The user will double click to continue and then be told to select two point for the primary particle sizing. The user will select two points corresponding to the diameter of the primary particle and a blue line will appear. The user will then click another two points corresponding to the diameter perpendicular to the first one and a red line will appear. If the particle was a single primary particle, the primary particle sizing process ends

here. For the aggregates, the user will be asked if they would like to analyse another primary particle. It is important that the user analyses a range of particles whose average size is representative of the aggregate's average primary particle size. Once the user does not wish to analyse any more primary particles they can select 'no' and the data will be exported to an excel document in "Output".

The user will then be asked if they want to analyse any more aggregates, if not, the program will end. If yes, the program will repeat itself.

When you use this code or modified version of this, it is expected that you refer to the appropriate articles by the main authors of this package.

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