

SIZE REDUCTION

LAB OVERVIEW

Level: Grades 9-16

Estimated Time to Completion: 90 Minutes

Prior Knowledge: Background Provided

In this lab investigation, students will become familiar with biomass size reduction, an important processing step in biofuel production that improves ease of transportation and increases the specific surface area to improve reactivity for either biological or chemical conversion. The reduction of the particle size is a mechanical process, and usually consists of cutting, chopping, or grinding which require significant energy input, making measurement of the size of the biomass critical so over-processing does not occur. Measuring the distribution of particle sizes can be done in a variety of means, with this lab using methods of a low cost document scanner and public domain software.

Upon completion, students will be able to:

- Understand the process and importance of particle size analysis.
- Understand the process and importance of image analysis.
- Calculate various average particle size and distributions.

MATERIALS REQUIRED

Desktop Document Scanner

Small Metal Spatula or Similar Tool

Computer with ImageJ Software

Computer with Spreadsheet Software

Nut or Coffee Grinder (to prepare size reduced biomass)

NOTES TO INSTRUCTOR

- It is recommended that students be able to generate their own scans. However, if there are limits on scanners and time, image files of scanned biomass particles may be provided to the students for analysis.
- It is recommended that the instructor prepare several different biomass samples using a lab grinder. A nut grinder may be used but may have difficulty with some harder wood samples. Samples that are ground to a fine powder are difficult to work with. Particles around $\sim 1/8$ to $3/8$ inch are typical for biomass and work well in this method.
- Care should be taken when grinding biomass as to not inhale dust.
- Instructions for installing ImageJ software is located in the "Supporting Materials" folder of the downloadable lab package.
- A tutorial video is also available at: <http://youtu.be/yQ1UeAUaacQ>