

Biofuel Co-products Lesson

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NARA

Northwest Advanced Renewables Alliance

SUPPLY CHAIN



FRP

FOREST RESIDUES PREPARATION

Primary feedstock targets include forest residues from logging and thinning operations. We are also considering mill residues and discarded woody material from construction and demolition, in regions where these materials are under utilized.



T

TRANSPORTATION

Feedstocks are transported from the collection site to a conversion facility. Chipping can take place at the loading or in a preprocessing facility.



PT

PRE-TREATMENT

Wood chips are treated to make the sugar polymers (polysaccharides) accessible to degrading enzymes. These processes allow the lignin to be available for separation.



EH

ENZYMATIC HYDROLYSIS

Specific enzymes are added to hydrolyze (break) the polysaccharides and generate simple sugars (monosaccharides).



F

FERMENTATION

Specialized yeast convert the monosaccharides into isobutanol.



BCP

BIOJET & CO-PRODUCTS

Aviation fuels can be generated from the platform molecules derived from wood sugars. Lignin can be used to generate co-products such as epoxies, structural materials and bio-based plastics. As an alternative, lignin can be burned to produce renewable energy.

ONE TON OF FRP
YIELDS 1000 LBS OF WOOD CHIPS

DIESEL

HEAT, WATER,
& ENZYMES

~600 POUNDS
ENZYMES

AND

~60 GALLONS
YEAST/TANIC

OR

~45 GALLONS
BIOJET

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Objectives

- what a biofuel co-product is
- why high value co-products are so important
- the ethics of renewable energy

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Wear safety glasses and gloves! Chemicals are hazardous if inhaled. Keep away from nose and mouth!

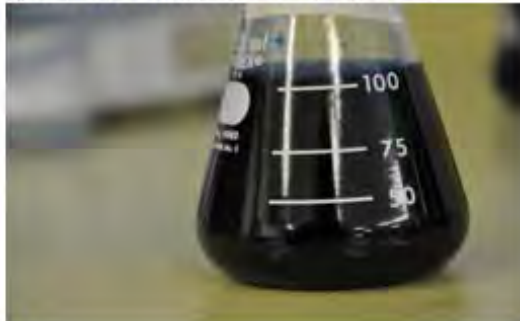
1) Label the Erlenmeyer flasks using pieces of tape with 0.05 g methylene blue, 0.04 g methylene blue, and 0.03 g methylene blue.



2) Measure out 0.05 grams, 0.04 grams and 0.03 grams of the methylene blue dye powder using the scale and pour into the respectively labeled Erlenmeyer flask.



3) Add 100 ml water to each flask and swirl.



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