

# **Making Biodiesel for Research and Education**


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# Program Overview

- Basics of biodiesel & lab training (Week 1)
- 50-gal batch biodiesel production (Week 2~3)
- Lab-scale biodiesel production from other alcohols (Week 2~3)
- Biodiesel washing experiment (Week 1; Week 5~6, if necessary)
- Pretreatment of waste cooking oil with high free fatty acid content (Week 4)



# Basics of biodiesel & lab training

- Background information of biodiesel
- Fundamental chemistry about biodiesel
- Recipe and procedure for biodiesel production
- Hands-on experience for materials preparation

# 50-gal batch biodiesel production

- Hands-on experience of making biodiesel in a batch scale reactor





# Lab-scale biodiesel production from other alcohols

- Under most cases, methanol is the first choice for biodiesel manufacturing
- Other alcohols (e.g. ethanol and isopropyl alcohol) are also eligible
- Parameters, such as yield of each case, are to be investigated
- GC/MS is to be used for profile identification of biodiesel produced from each alcohol



# Biodiesel washing experiment

- The influence of temperature and acidity on water washing effect is to be investigated
- Parameters such as recovery and water usage are to be recorded and compared
- Dry washing via waste material (waste coffee ground) is to be tested (if time permits)



# Pretreatment of waste cooking oil with high free fatty acid content

- Free fatty acid (FFA) harms the conventional alkaline-catalytic transesterification
- The acceptable level is  $\leq 1\%$  wt (0.5% is preferred); oil with higher level should be pretreated
- Esterification is applied for converting FFA into ester (biodiesel) in pretreatment step
- Kinetics of this reaction will be studied for waste cooking oil with high FFA level