



יום עיון בנושא חדשנות בדלקים ו להשפעתם על הסביבה, 19.12.18

Efficient Process of Biodiesel Production from Brown Grease

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and Nisnevitch M.

Gasoline Consumption in Israel 95



Background

Environmental pollution from burning fossil fuels

The depletion of fossil fuel sources

Search for renewable sources of alternative fuels

Sun radiation (solar energy)

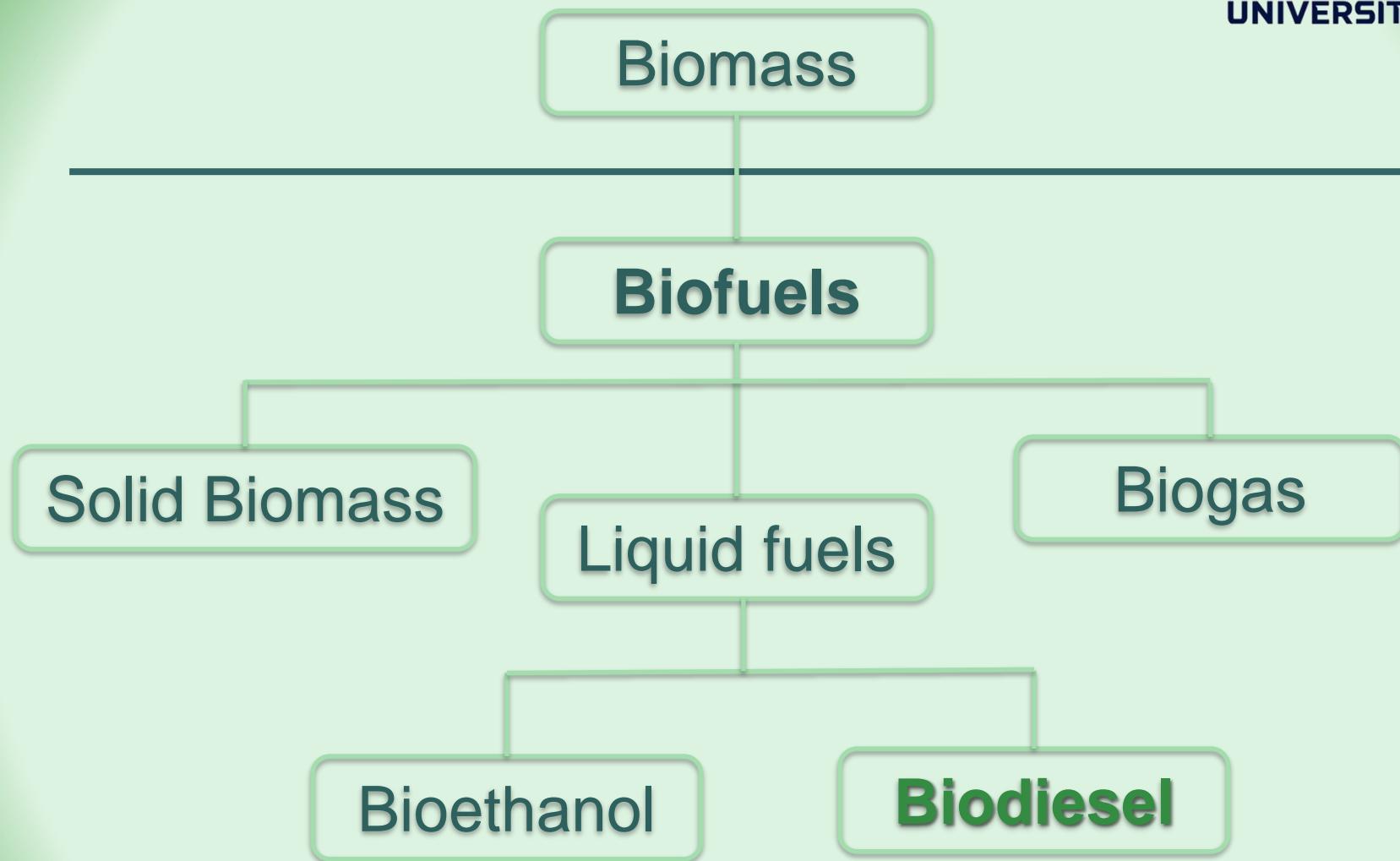
Wind - using a wind turbine

Flow - (rivers and sea waves) using turbines

Geothermal energy

Bioenergy -
fuel cells and
biofuel





Fuel Substitutes for Public Transportation



Biodiesel feedstocks

Vegetable oil feedstock
(rapeseed, soybean, ...)



Yellow grease (used vegetable oil, animal fats, ...)



Algae



Brown grease



Sources of Brown grease

Food Industry



Restaurants



Cafeterias



Grease Trap



Grease trap waste (GTW) disposal methods

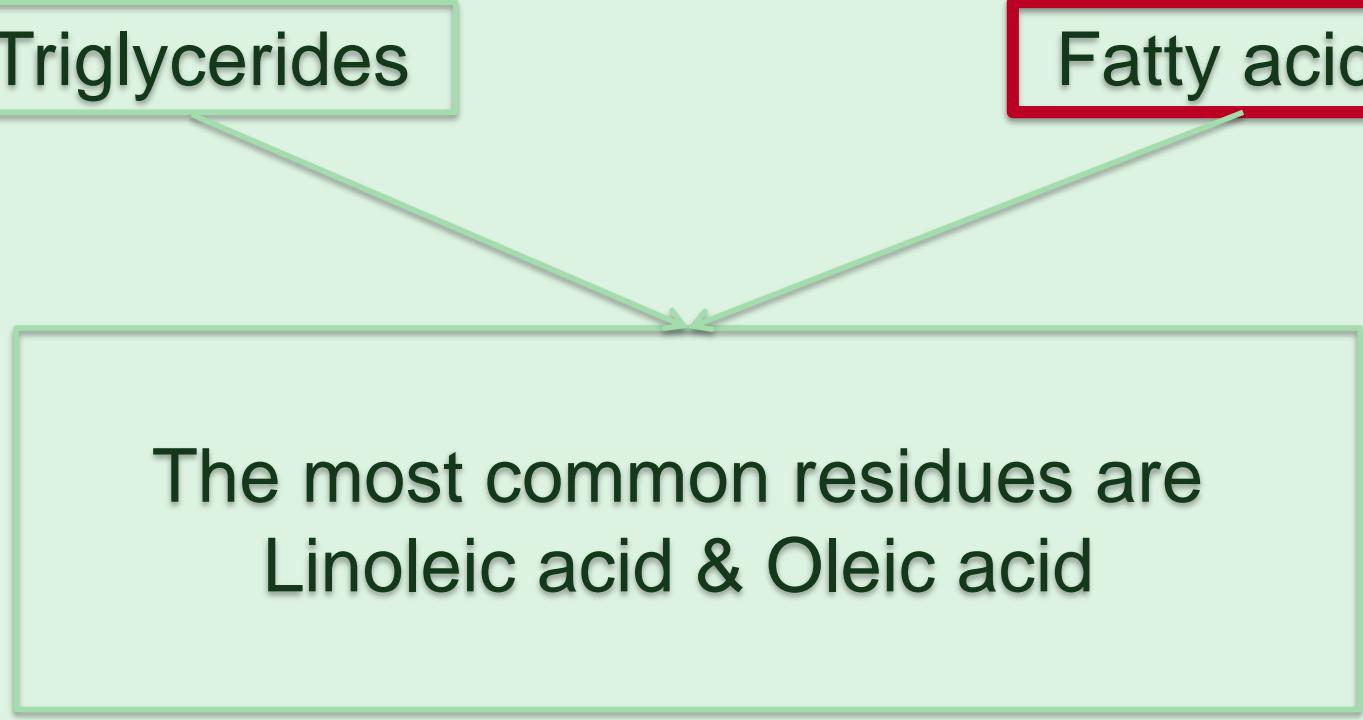
- Landfill
- Incineration
- Anaerobic digestion



Lipid Forms in Brown Grease

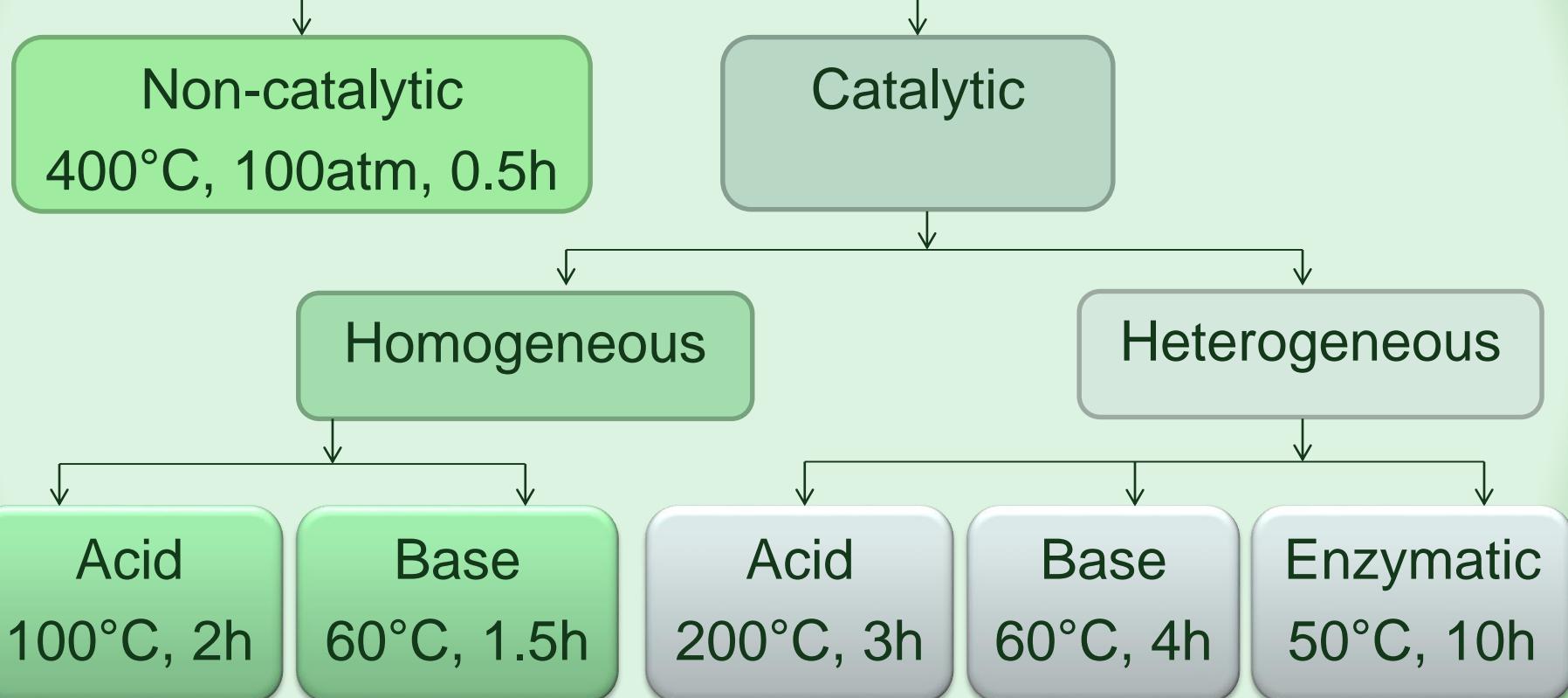
Triglycerides

Fatty acids

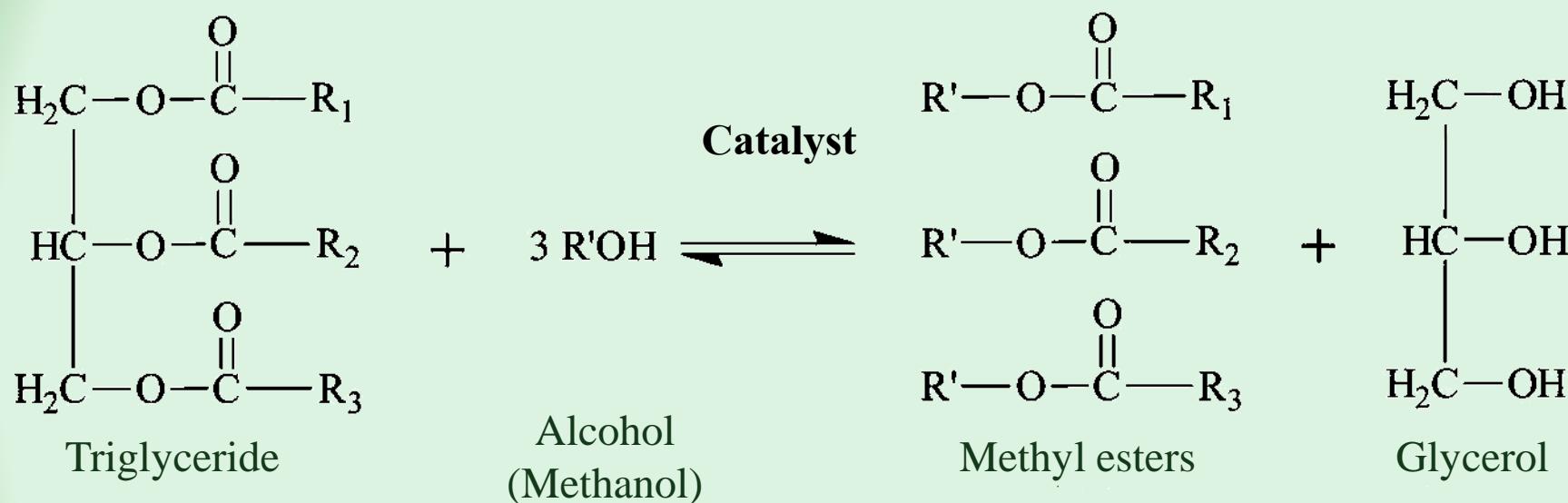


The most common residues are
Linoleic acid & Oleic acid

Biodiesel production



Transesterification of Triglycerides for Biodiesel Production

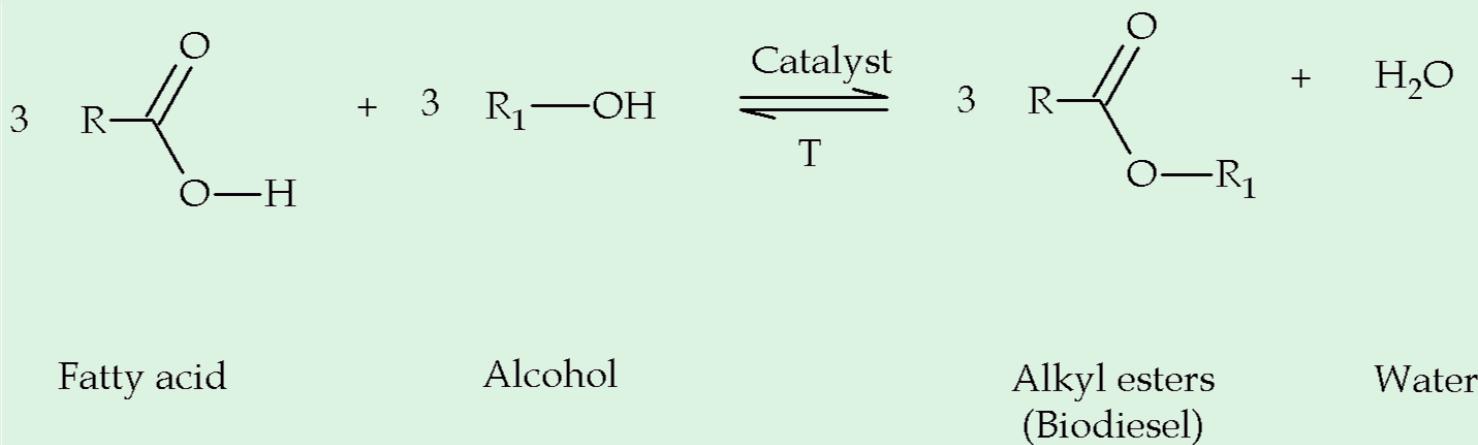


Catalyst: Basic - KOH, NaOH, NaOCH₃

Acid – HCl, H₂SO₄

Enzymes

Esterification of FFA for Biodiesel Production



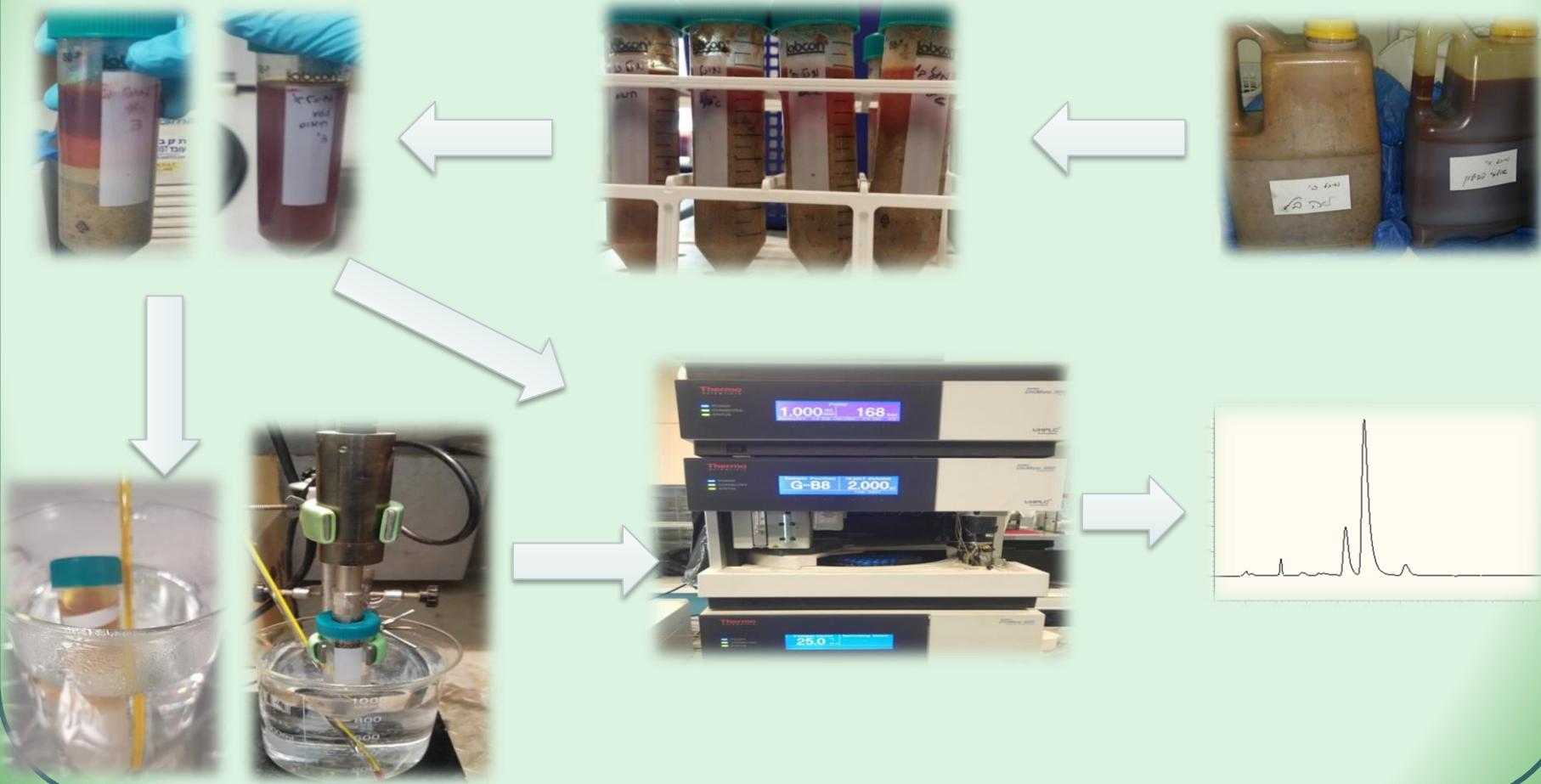
Catalyst: Acid – HCl, H₂SO₄
Enzymes

The Aim of the Study

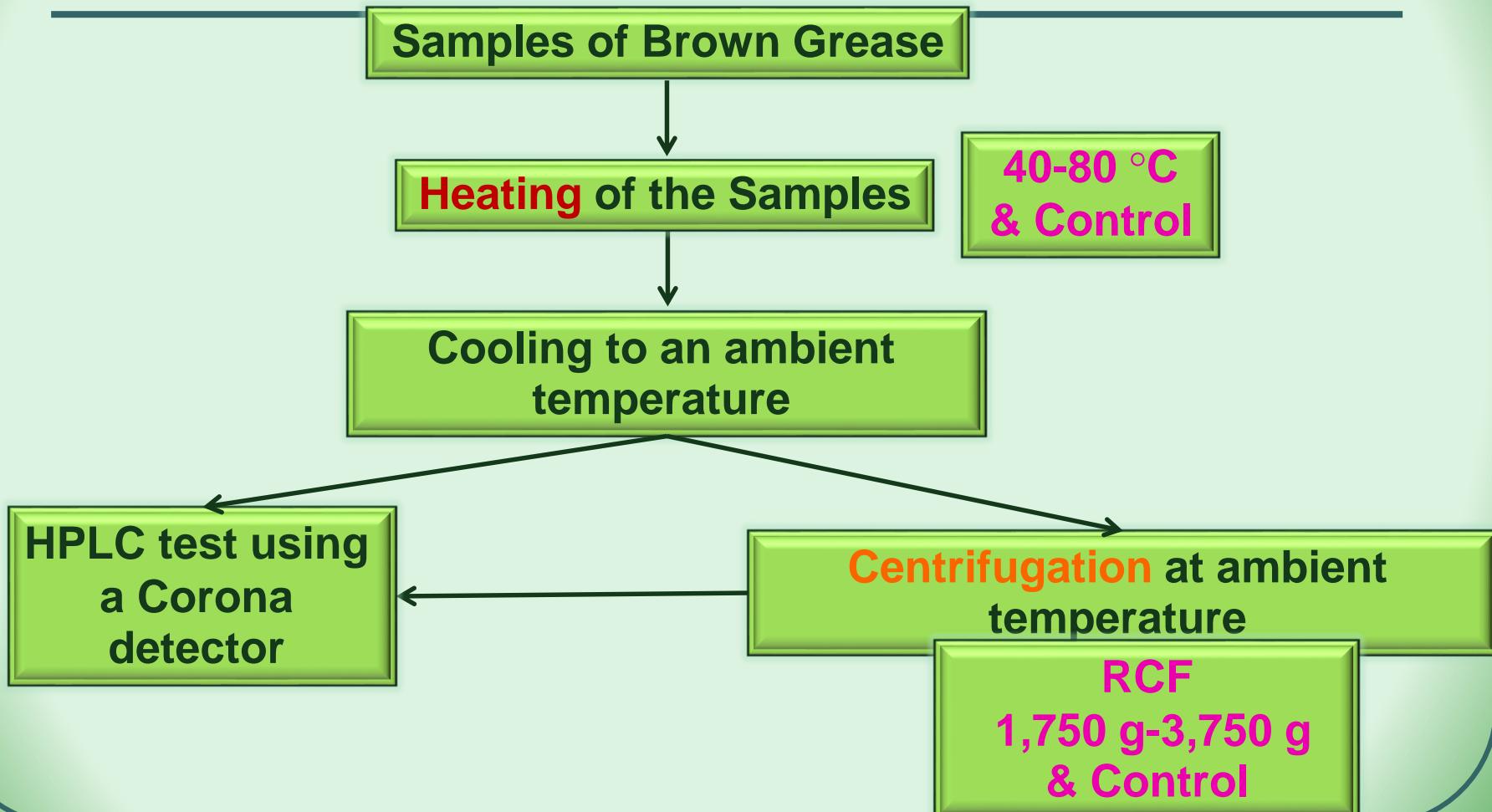


**Development of fast, effective and
low cost biodiesel production from
brown grease**

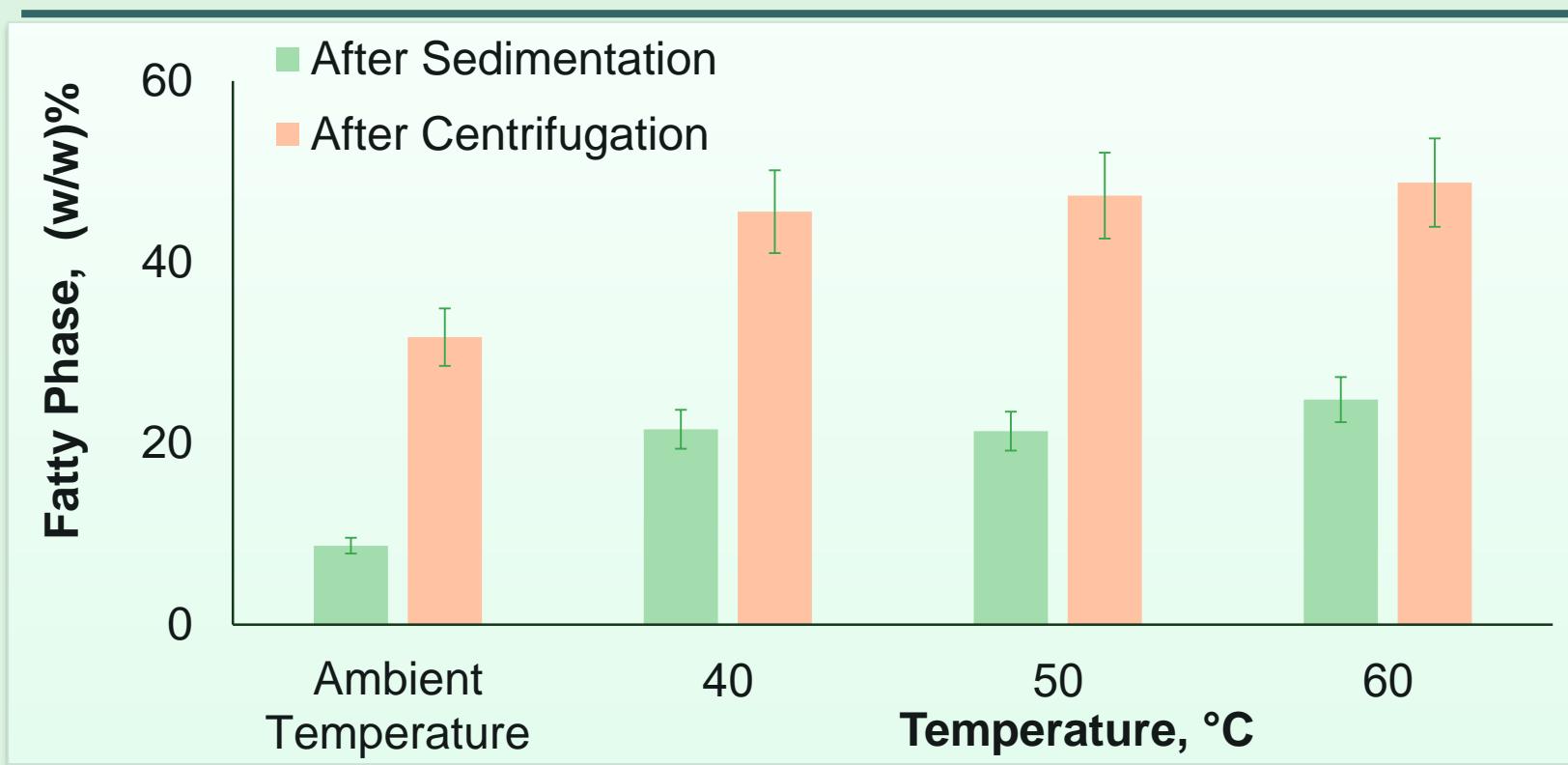
Experimental Process



Phase Separation by Sedimentation or Centrifugation at Various Temperatures



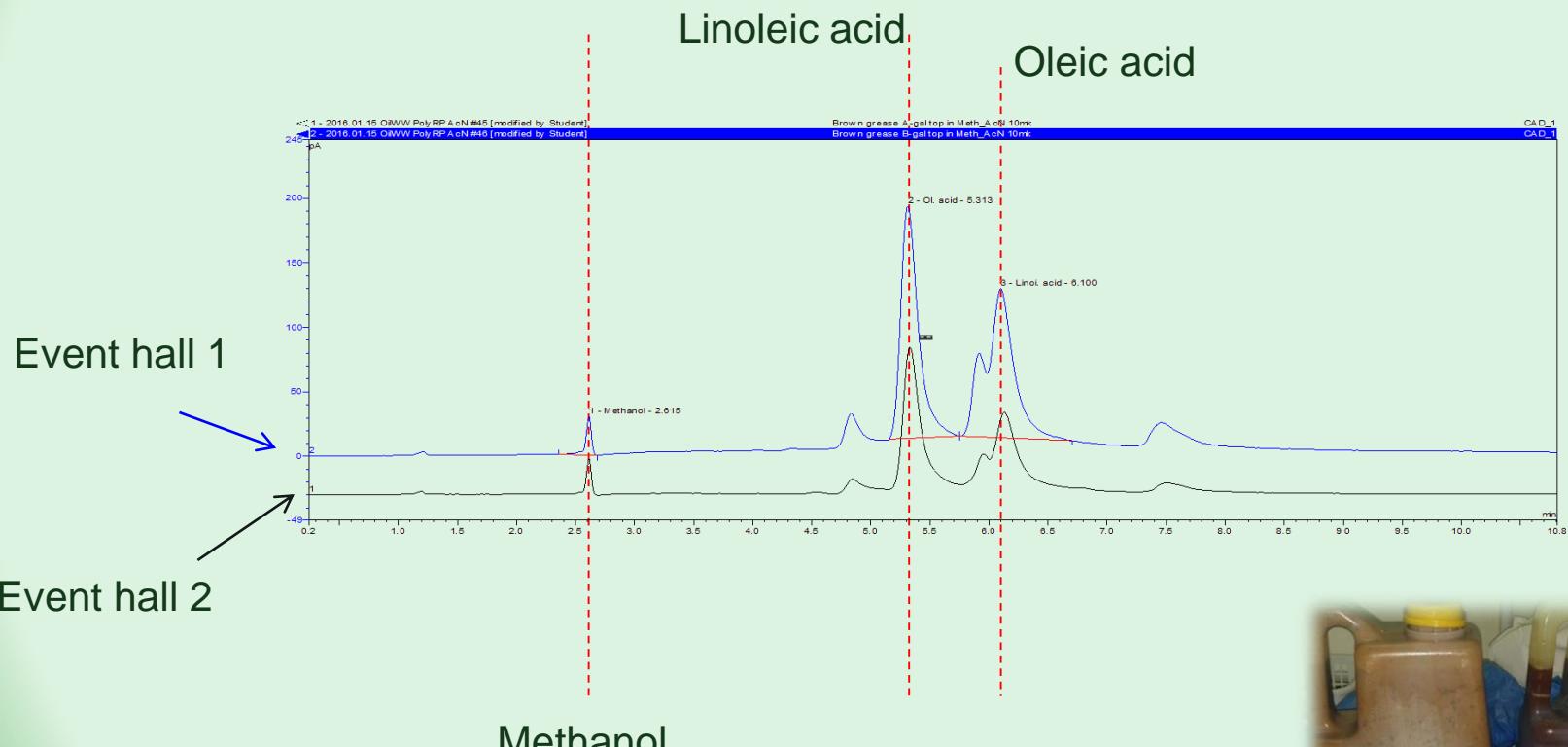
Separation of the Fatty Phase



Time of heating - 15 min

Time of Centrifugation - 2 min, Centrifuge velocity - 1500 rpm

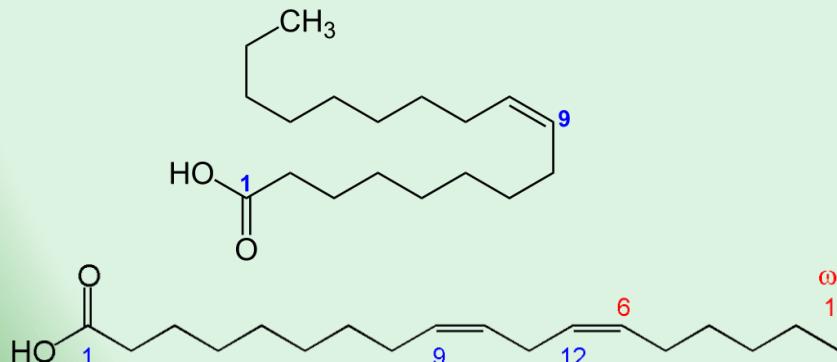
The Brown Grease Composition



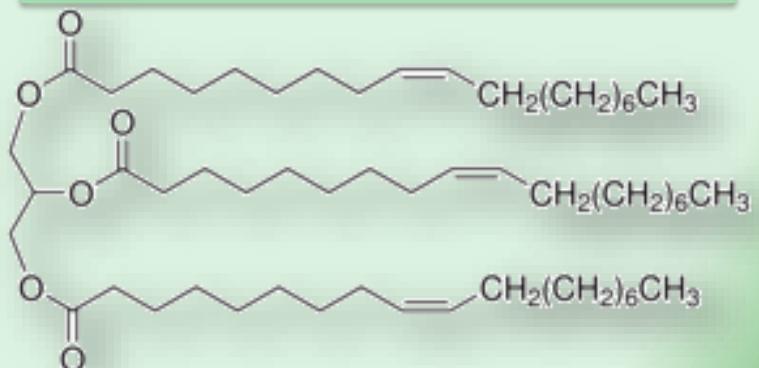
Model Systems



Oleic and Linoleic acids

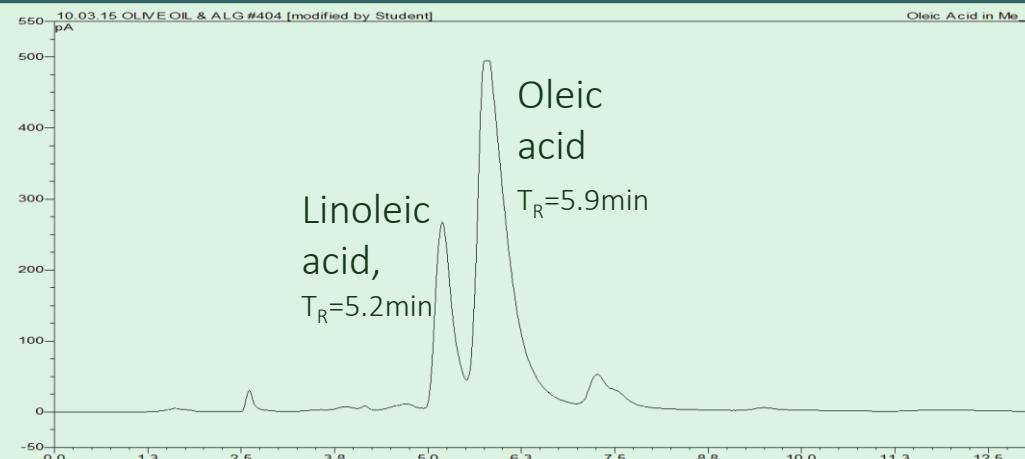


Glyceryl Trioleate (GTO)

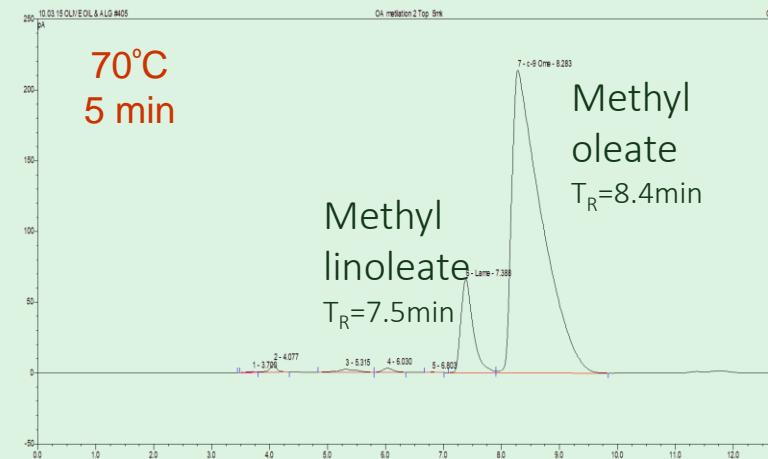


Oleic and Linoleic acid before and after esterification

Oleic and Linoleic acids

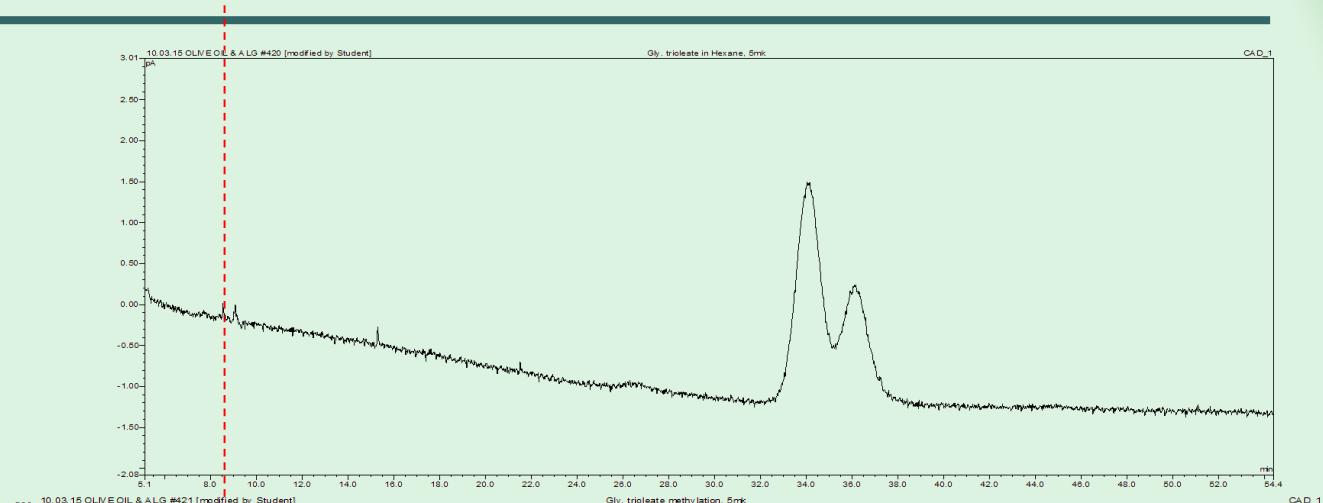


Oleic acid and Linoleic acid after esterification

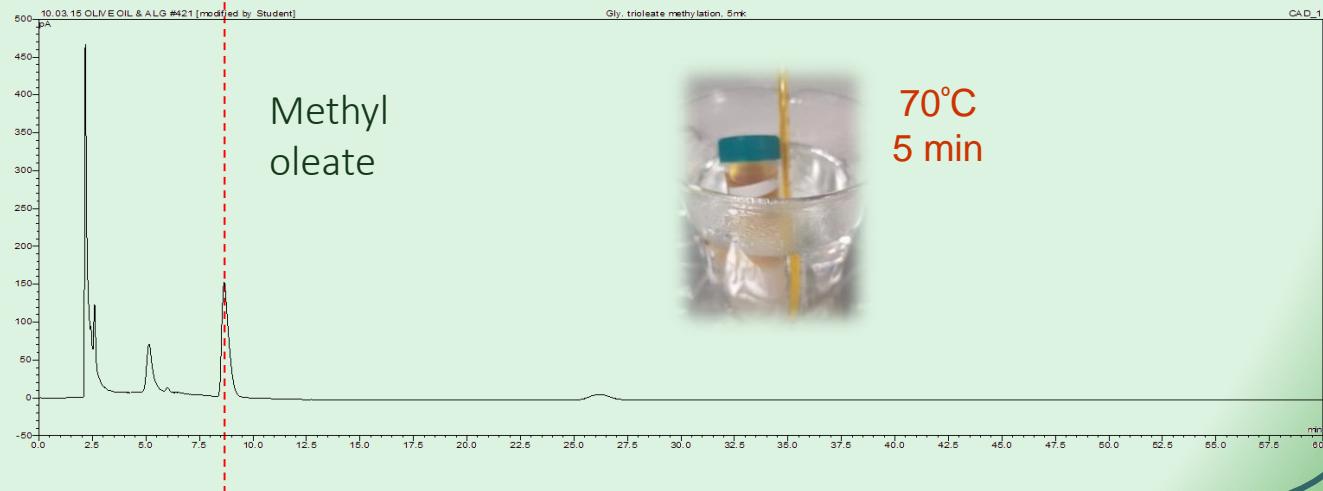


GTO before and after Transesterification

GTO

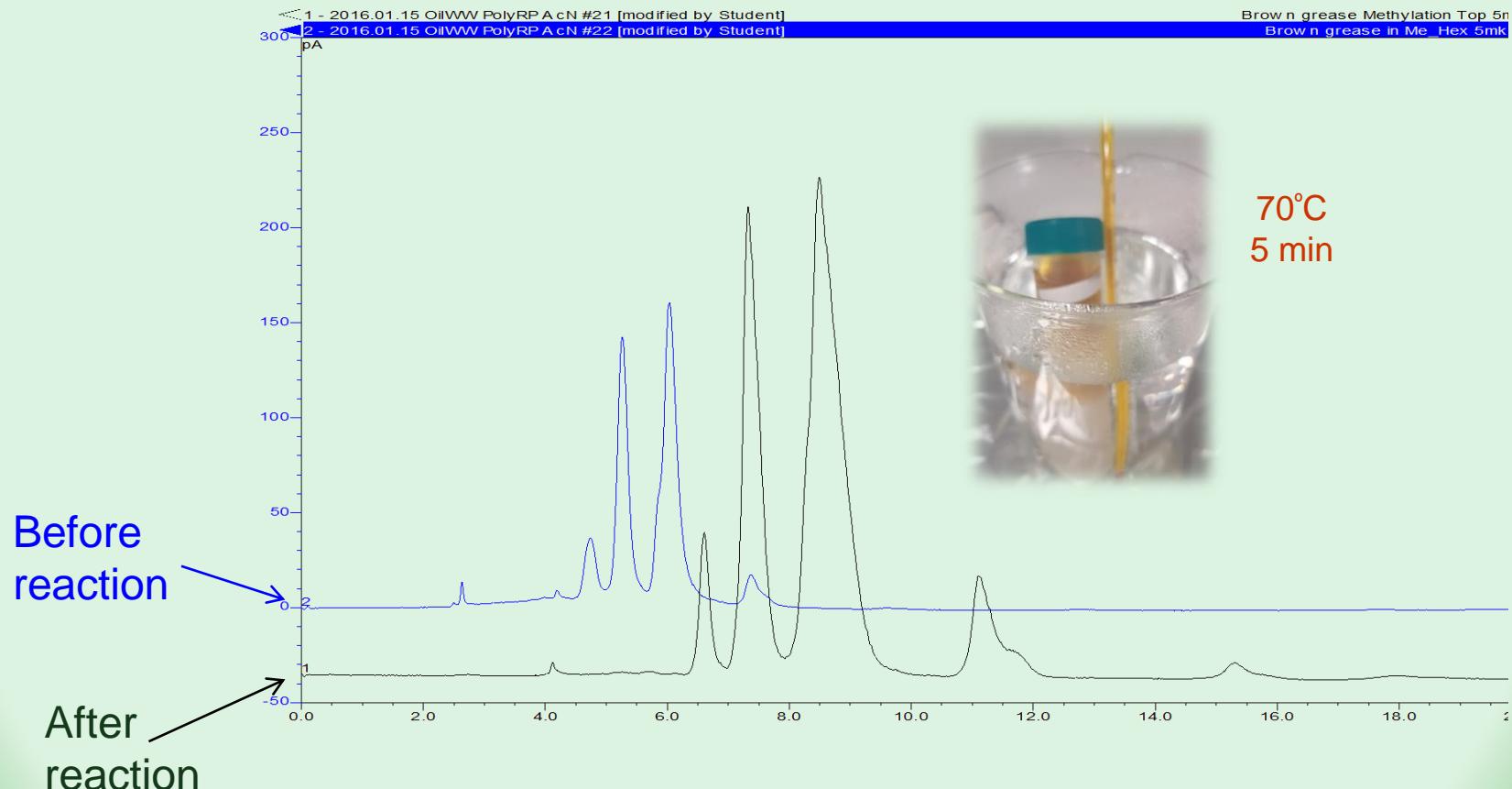


GTO after the transesterification



70°C
5 min

Brown Grease before and after Reaction



Conclusions

- **Free Fatty Acids** content in Brown Grease is **very high**
- Brown Grease can be used for **biodiesel production**
- Biodiesel can be produced within **several minutes**

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thank you!

