LATINOAMERICANO

Bio refinerías

Materiales y Energ

4, 5 y 6 de mayo de 2009. Concepción, Ch

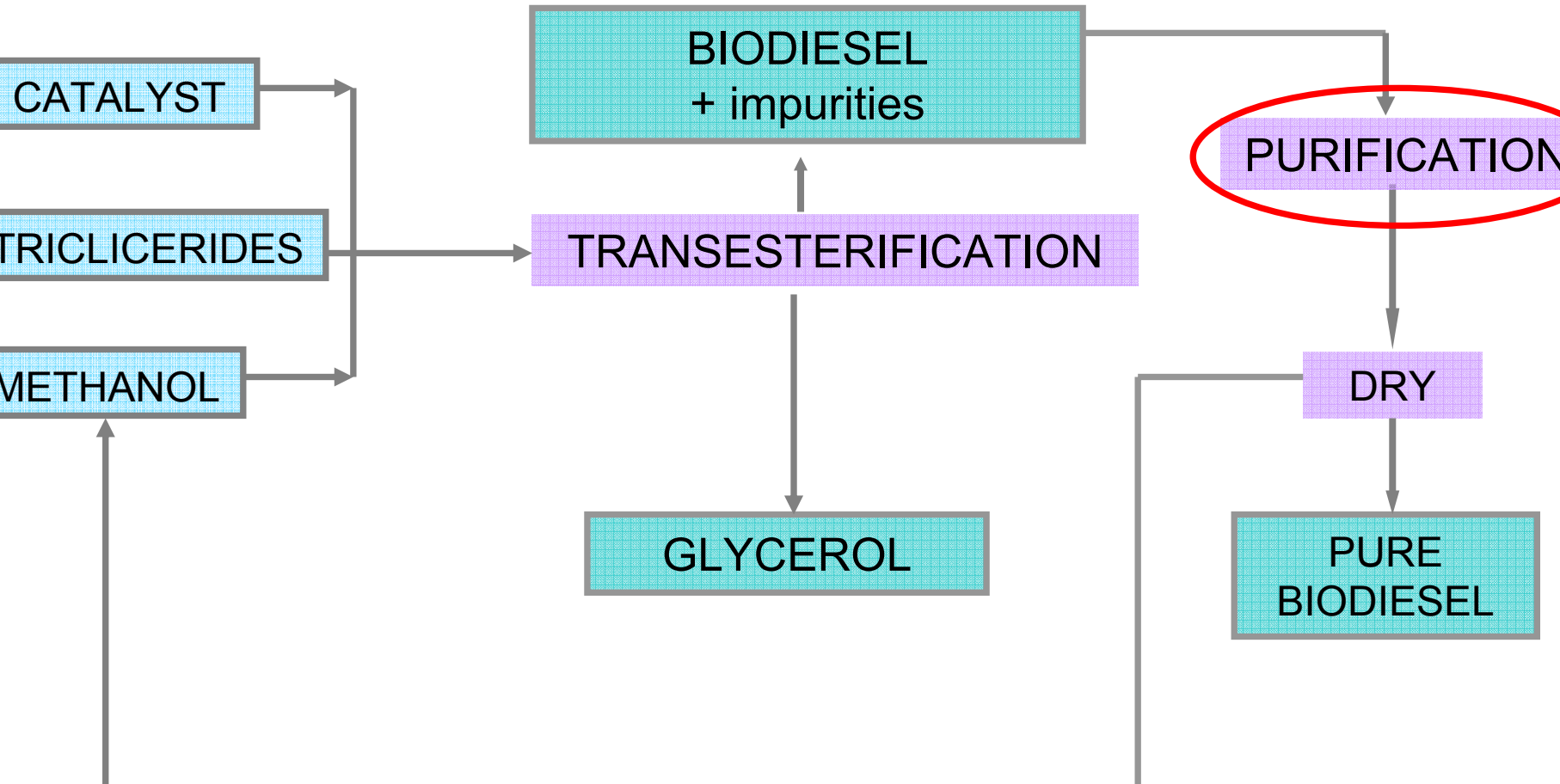
USE OF POLYESTERS SYNTHERIZED FROM GLYCEROL TO SODIUM REMOTION IN BIODIESEL

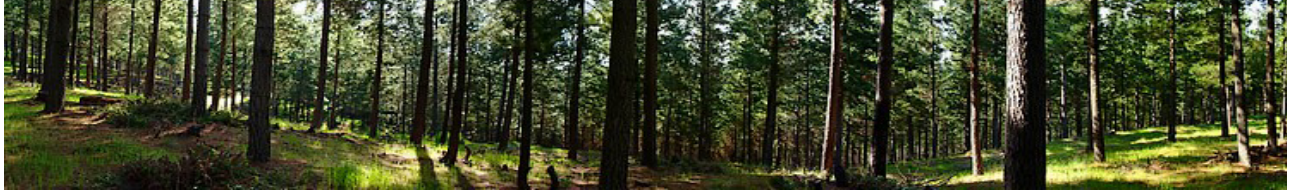
CLAUDIO ANDRÉS TORO AEDO

UNIVERSIDAD DE LA FRONTERA

- ✓ INTRODUCTION
- ✓ OBJECTIVE
- ✓ EXPERIMENTAL SECTION
- ✓ RESULTS Y DISCUSSION
- ✓ CONCLUSIONS

BIODIESEL PRODUCTION PROCESS





CATALYST USED

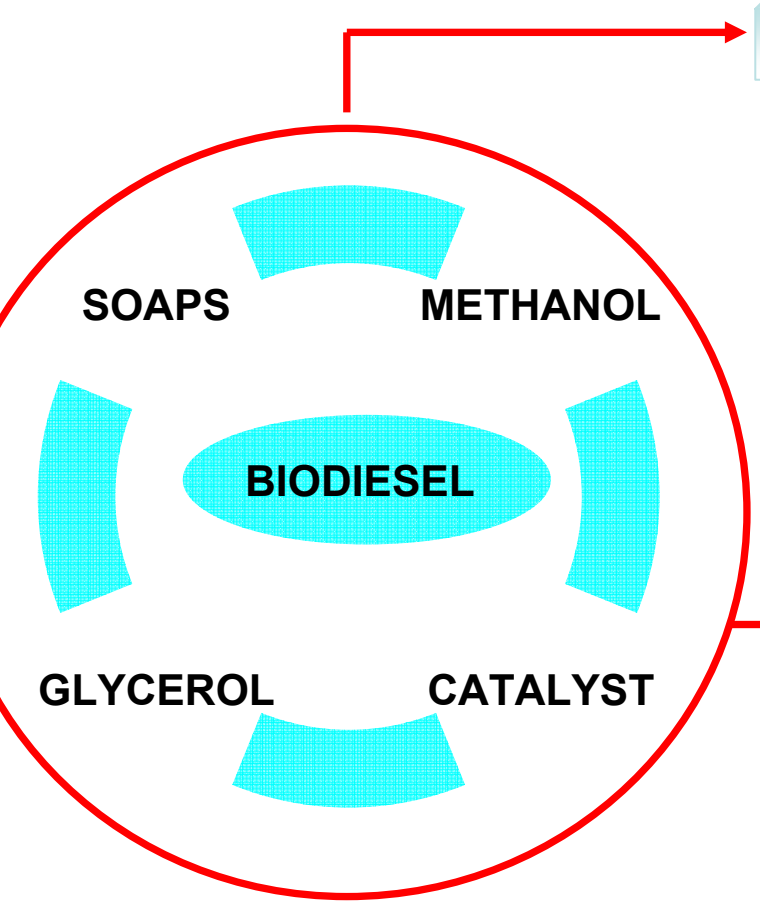
CATALYST

- HETEROGENOUS
  - alkaline-earth metal compounds
  - titanium -silicates
  - enzymes
  - anion exchange resins
- HOMOGENOUS
  - sulphuric acid
  - sodium methoxide
  - hydrochloric acid
  - sodium hydroxide
  - sulfonic acid
  - potassium hydroxide

- ✓ **PROCESS IS FASTER**
- ✓ **REACTION CONDITIONS MODERATED**

MPURITIES IN BIODIESEL

INTRODUCTIO

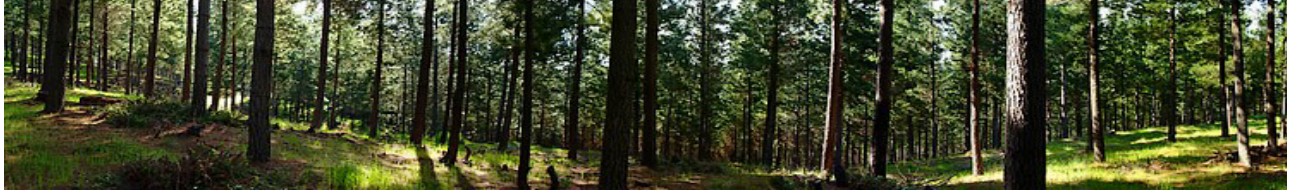


SINTHESIS OF BIODIESEL

- CONSUME THE CATALYST
- BIODIESEL YIELD
- COMPLICATE PURIFICATION

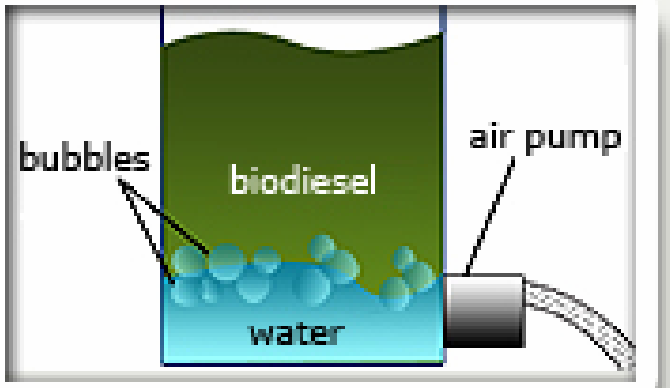
DIESEL ENGINE

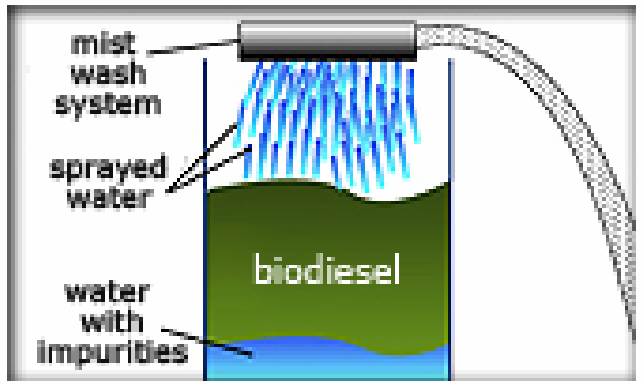
- CORROSION
- CATALYTIC CONVERTERS
- ENVIRONMENTAL DAMAGES



PURIFICATION METHODS FOR BIODIESEL

WET WASHING

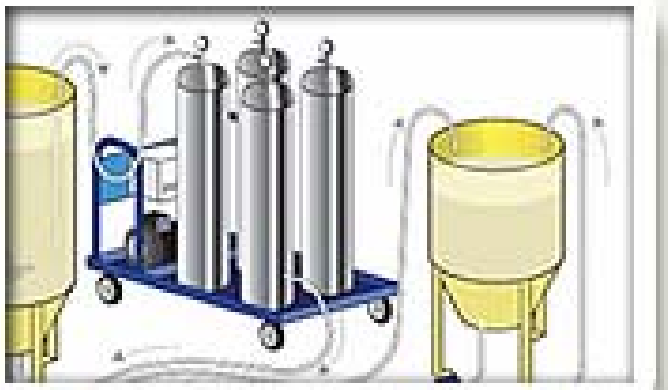




DRY WASHING

DSORBENT
ATERIAL

- Ion exchange resin
- Magnesium silicate
  Magnesol®)
- Biological compounds
  Eco2Pure)



PURIFICATION METHODS FOR BIODIESEL

MAIN DIFERENCE BETWEN TWO PROCESS

TO MINIMIZE COSTS OF PRODUCTION

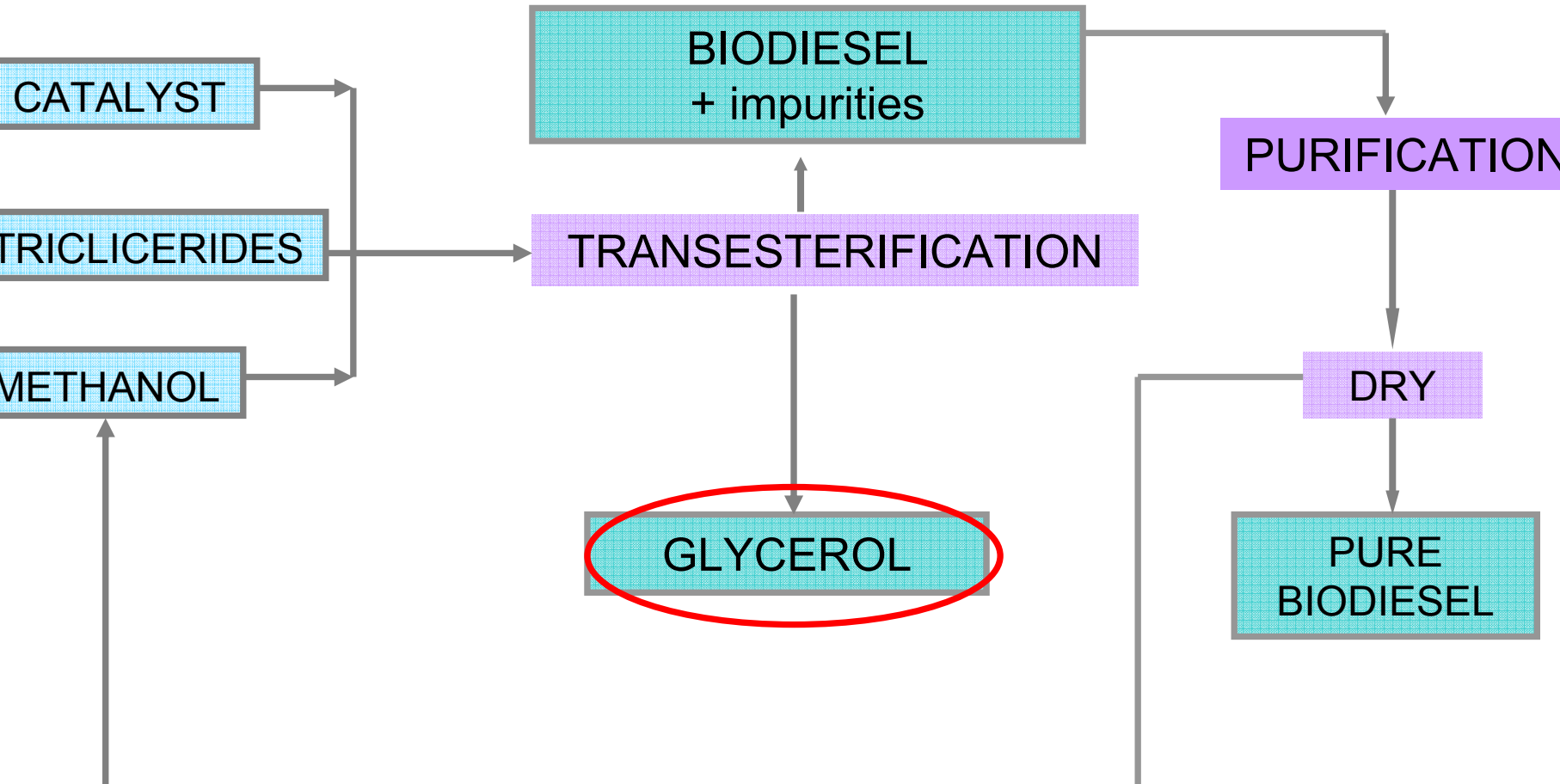
WET WASHING

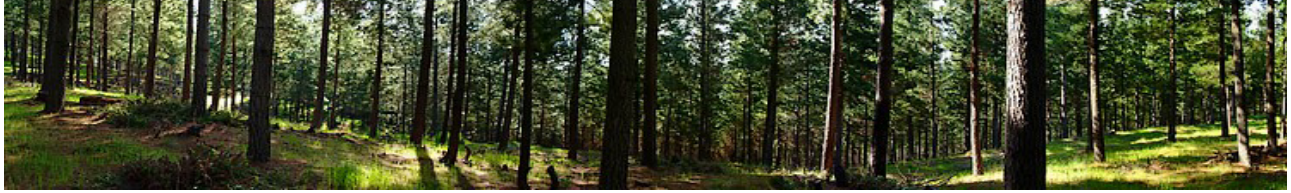
- WATER SUPPLY AND COST
- WASTEWATER TREATMENT
- EMULSIONS FORMATION

DRY WASHING

- ~~WATER SUPPLY AND COST~~
- ~~WASTEWATER TREATMENT~~
- ~~EMULSIONS FORMATION~~

BIODIESEL PRODUCTION PROCESS



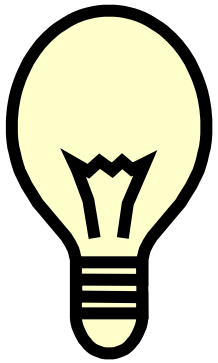


GLYCEROL USES

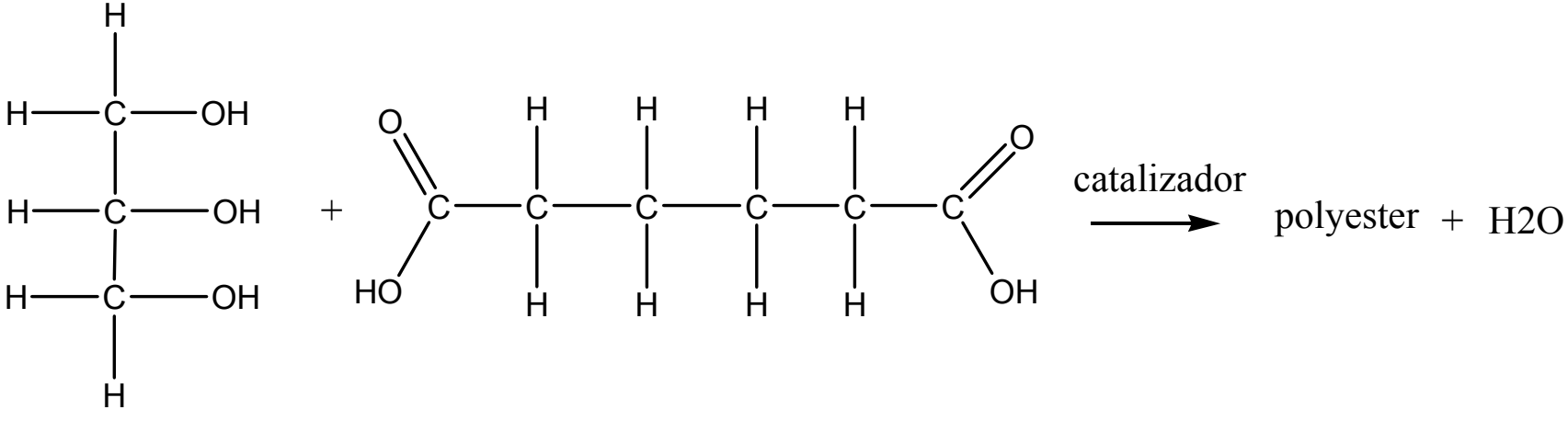
- **GASOLINE REFORMULATION**
  glycerol tertiary butyl ether (GTBE)
  methyl tertiary butyl ether (MTBE)

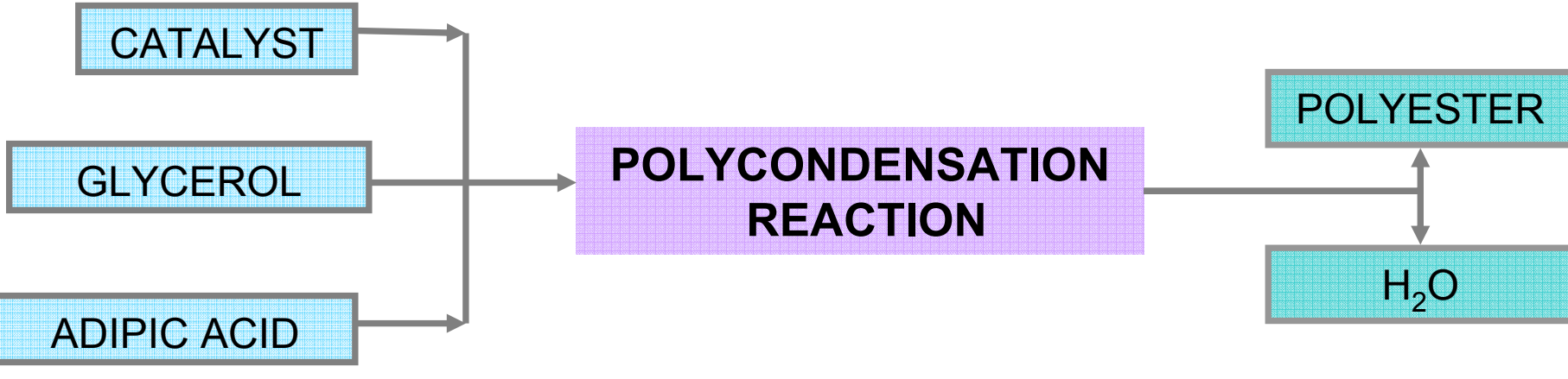
- **BIOTECHNOLOGICAL PRODUCTION**
  propanediol
  H_2
  ethanol

- **DEVELOPMENT OF BIOMATERIALS**
  adsobents materials
  composites and bio-polymers



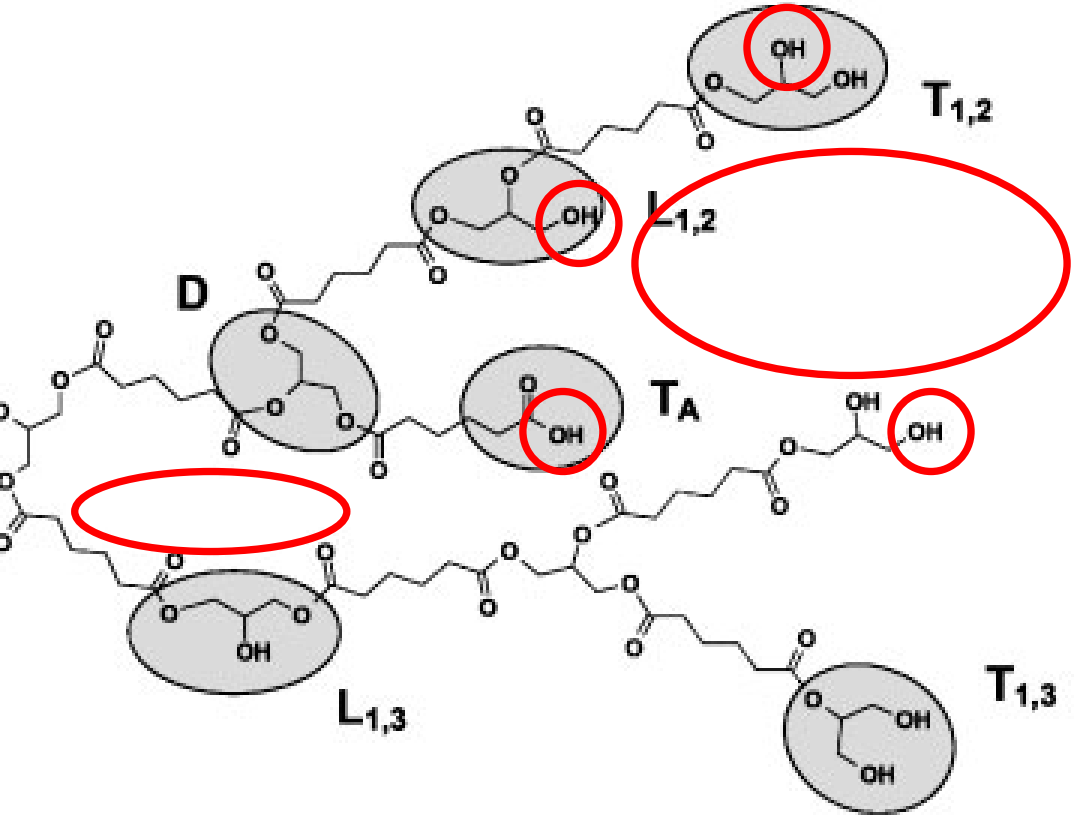
OLYESTERS SYNTHERIZED FROM GLYCEROL





OLYESTERS SYNTHERIZED FROM GLYCEROL

oly(glyceroladipate)



- ✓ **FUNCTIONAL GROUPS (POLARITY, ION EXCHANGE)**
- ✓ **BRANCHED (*CROSSLINKED*)**

From Stumbé and Bruchmann (2004)

- ✓ INTRODUCTION
- ✓ **OBJECTIVE**
- ✓ **EXPERIMENTAL SECTION**
- ✓ **RESULTS Y DISCUSSION**
- ✓ **CONCLUSIONS**

LATINOAMERICANO

Bio refinería

Materiales y Energ

4, 5 y 6 de mayo de 2009. Concepción, Ch

OBJECTIVE

- **STUDY THE DIFFERENT ASPECTS OF BIODIESEL PRODUCTION PROCESS**
- **DEVELOP AN ALTERNATIVE USE FOR BY-PRODUCT GLYCEROL**
- **ELIMINATION OF CATALYST RESIDUALS AND SOAPS**

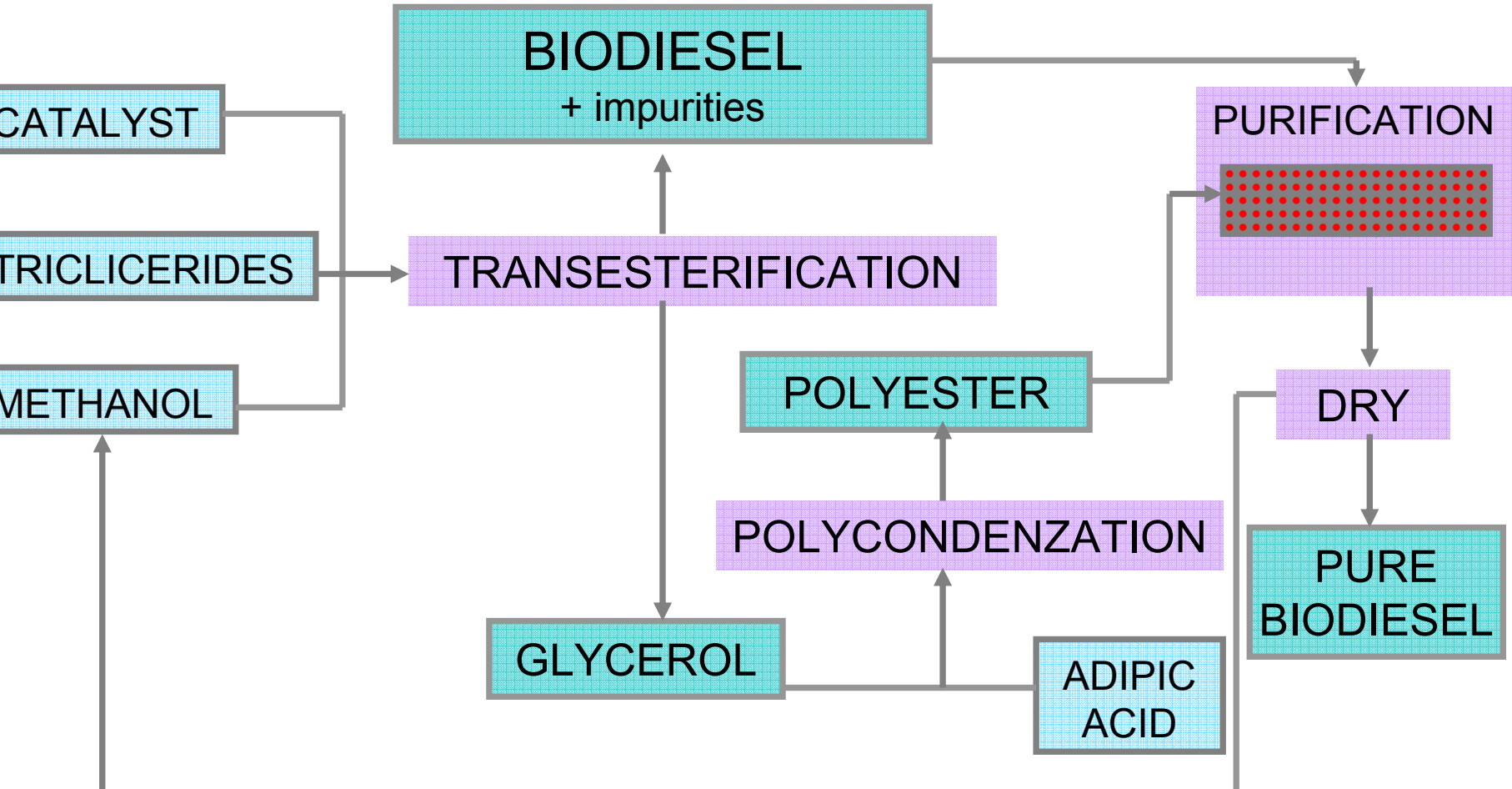
LATINOAMERICANO

Bio refinería

Materiales y Energ

4, 5 y 6 de mayo de 2009. Concepción, Ch

OBJECTIVE



- ✓ INTRODUCTION
- ✓ OBJECTIVE
- ✓ **EXPERIMENTAL SECTION**
- ✓ **RESULTS Y DISCUSSION**
- ✓ **CONCLUSIONS**

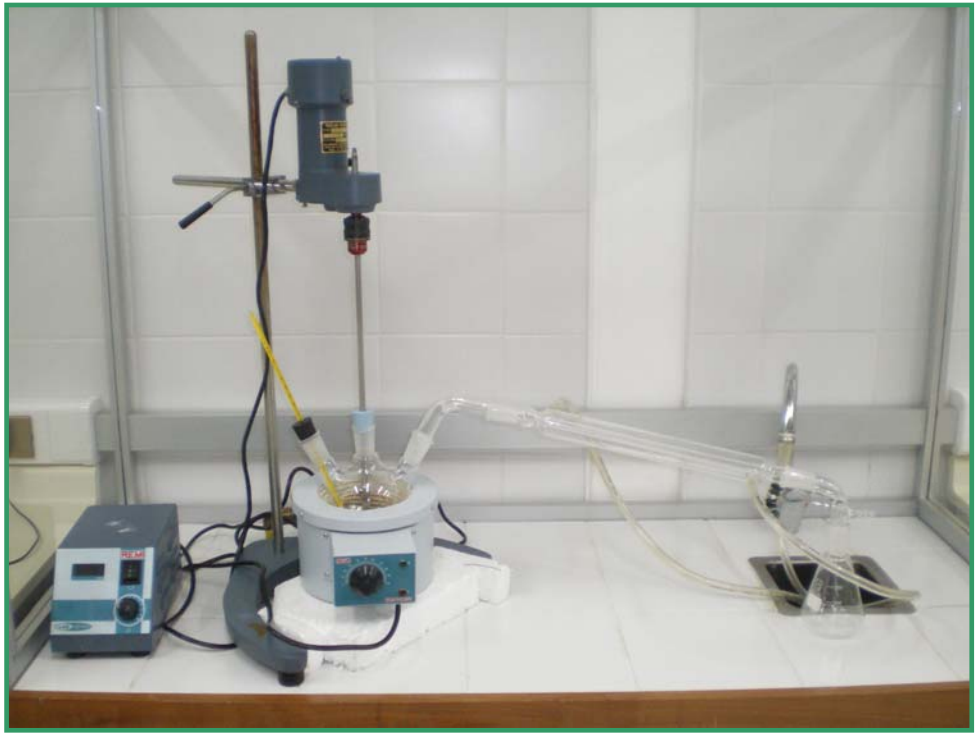
SYNTHESIS OF POLYESTERS

EXPERIMENTAL SECTION

INITIAL FORMULATION[1]

sample	gly/Adpic ac.
POLA I	1:1
POLA II	1:1,5
POLA III	1:2

Brioude et al., 2007



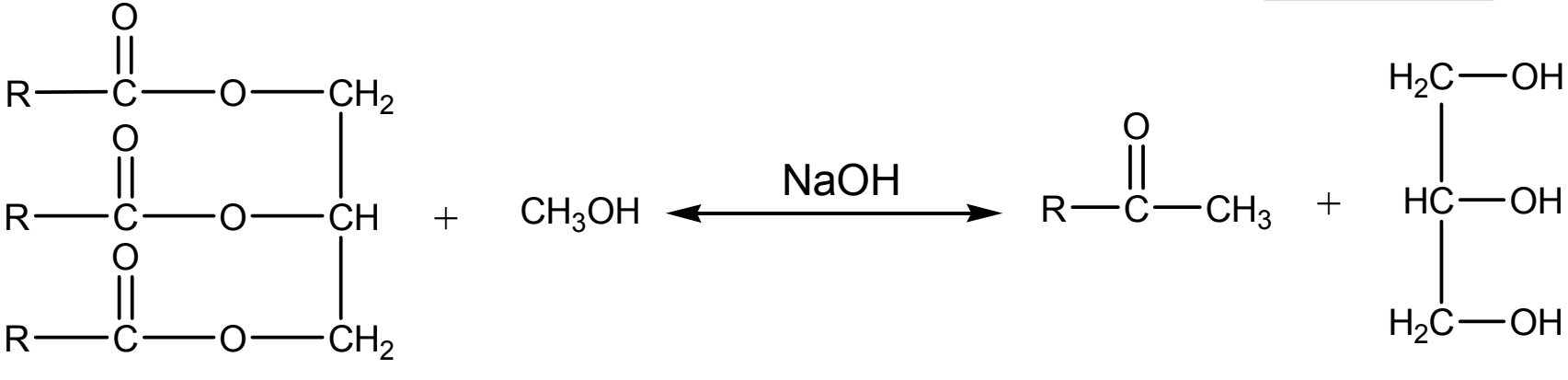
- ✓ **Stirring system**
- ✓ **Heating system**
- ✓ **Claisen condenser**
- ✓ **Termometer**

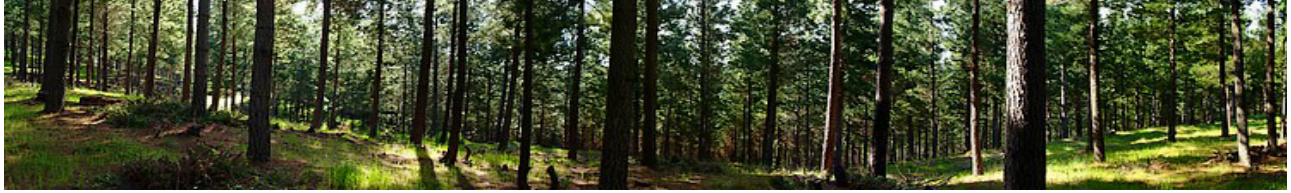
EXPERIMENTAL SECTION

SINTHESIS OF BIODIESEL

+

=





LATINOAMERICANO

Bio refinerías

Materiales y Energ

4, 5 y 6 de mayo de 2009. Concepción, Ch

PURIFICATION EXPERIMENT

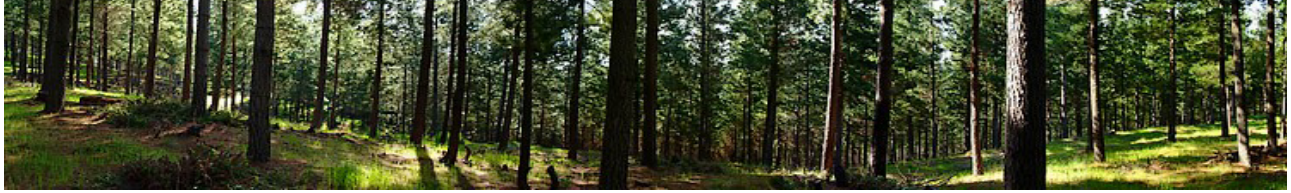
EXPERIMENTAL SECTION

OPERATION PARAMETERS

Sweelling time	1 hora
Feed flow to column	1,5 ml/min
Dry adsorbent mass	2 g
Operation temperature	25ºC

- ✓ POLA I
- ✓ POLA II
- ✓ POLA III
- ✓ AMBERLIST 15
- ✓ SILICE
- ✓ ZEOLITE

- ✓ INTRODUCTION
- ✓ OBJECTIVE
- ✓ EXPERIMENTAL SECTION
- ✓ **RESULTS Y DISCUSSION**
- ✓ **CONCLUSIONS**

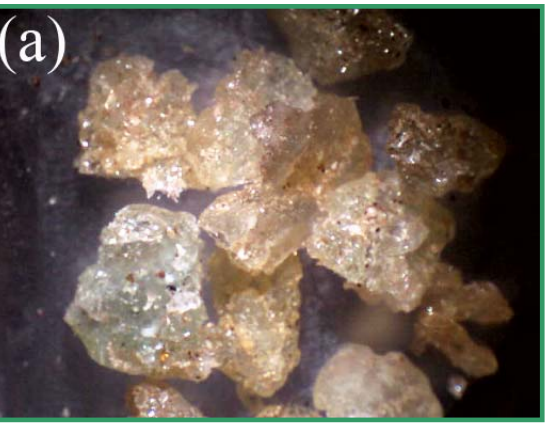


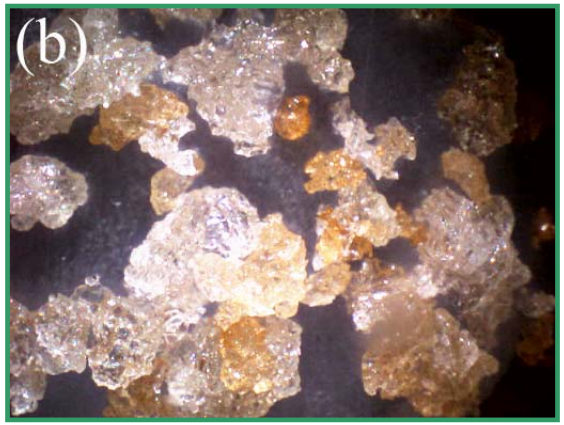
POLYESTERS CHARACTERIZATION

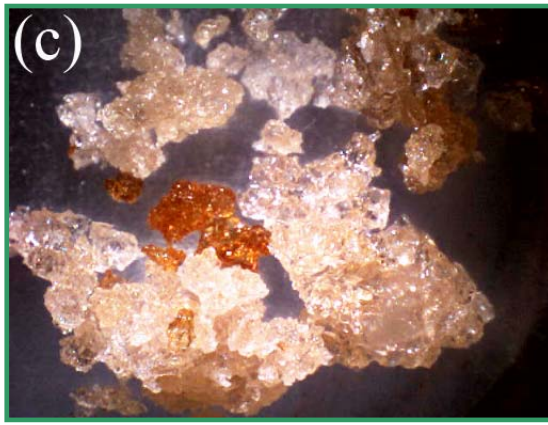
RESULTS

✓ OPTICAL LIGTH

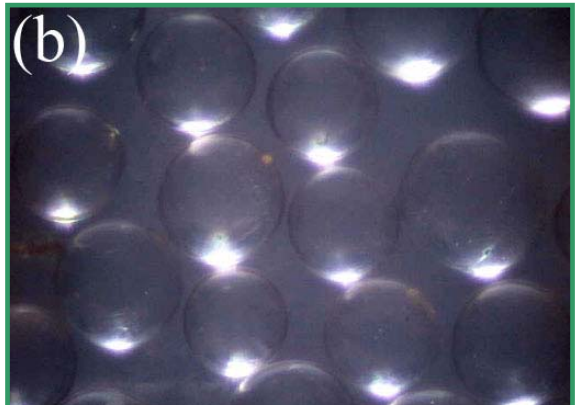
POLA SERIE: (a) POLA I, (b) POLA II y (c) POLA III

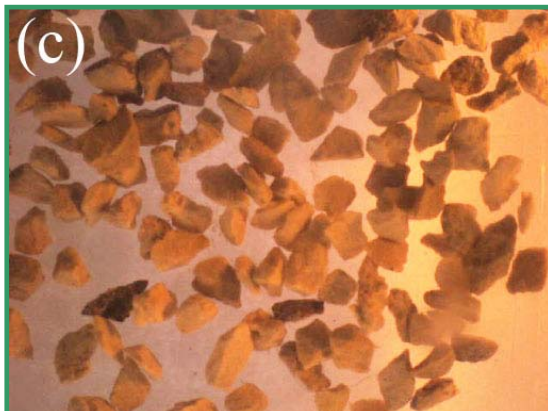






TRADITIONAL MATERIAL ADSORBENTS : (a) Amberlyst 15, (b) Silice y (c) Zeolite

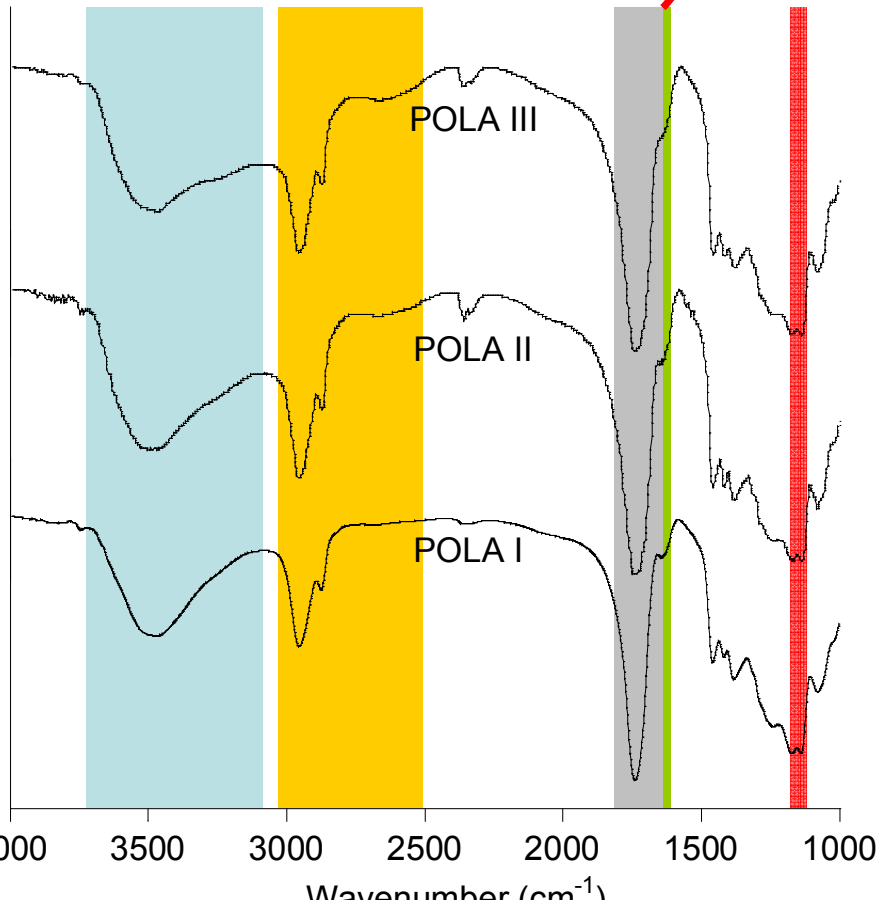


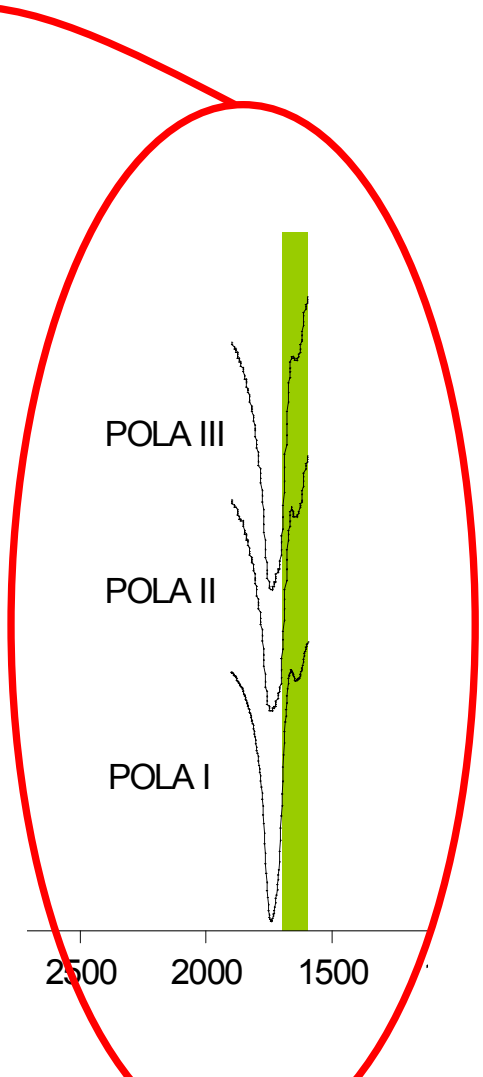


POLYESTERS CHARACTERIZATION

RESULTS

✓ FTIR Analysis





ν(O-H) alcohol

ν(C=O) ester

δ(C-C) ester

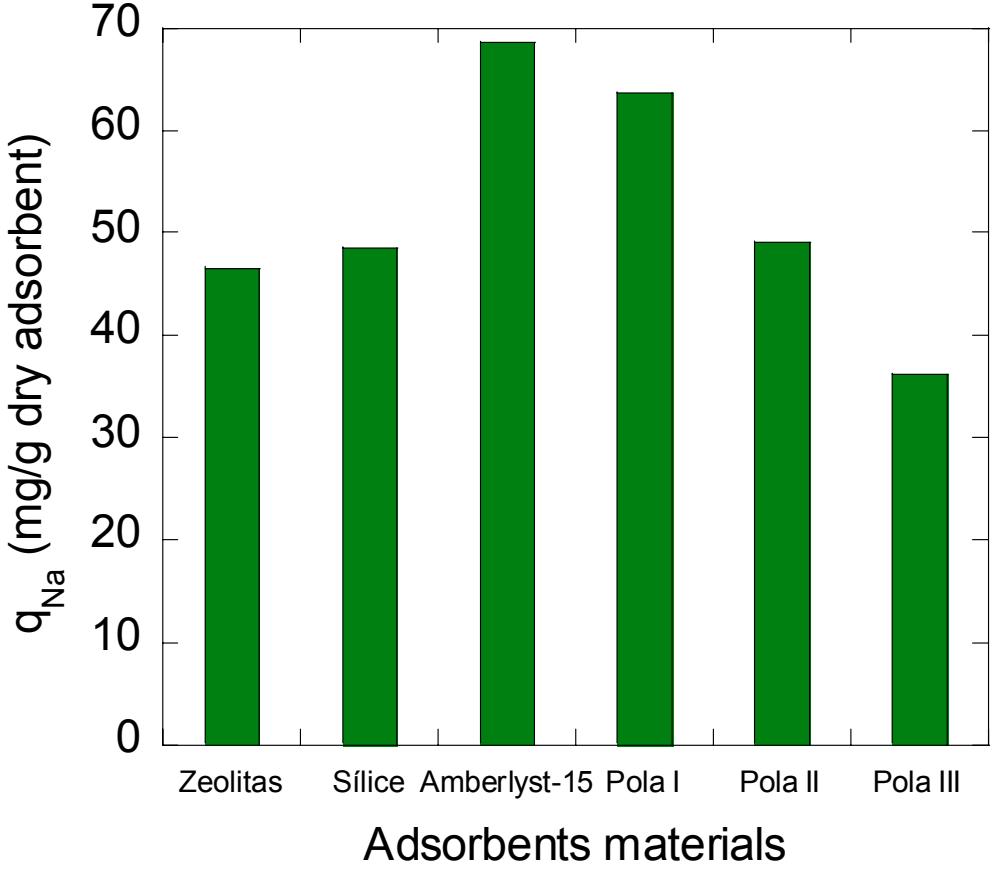
ν(C=O) carboxilic ac

ν(O-H) carboxilic aci

SODIUM REMOTION

RESULTS

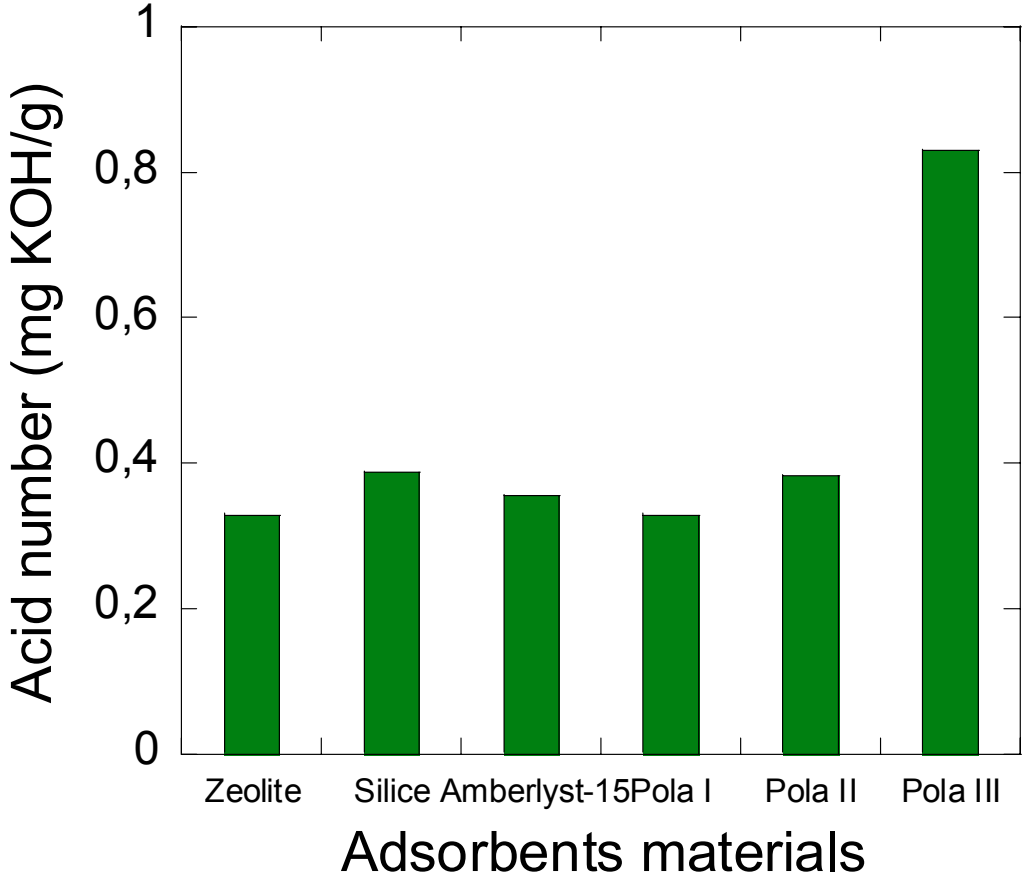
✓ ATOMIC ABSORPTION SPECTROSCOPY



ACID NUMBER

RESULTS

✓ ACID NUMBER (TEST METHOD D 664)



Biodiesel limit 0.80 mg of KOH/g sample

Biodiesel without treatment 0.22 mg KOH/g

LATINOAMERICANO

Bio refinerías

Materiales y Energ

4, 5 y 6 de mayo de 2009. Concepción, Ch

- ✓ INTRODUCTION
- ✓ OBJECTIVE
- ✓ EXPERIMENTAL SECTION
- ✓ RESULTS Y DISCUSSION
- ✓ **CONCLUSIONS**

CONCLUSIONS

- Manufactured polyesters reached a Na remotion capacity similar to it accomplished by other adsorbents

- This phenomenon can be explained for the difference among the polarity of the currents to separate and the adsorbents nature

CONCLUSIONS

- With the realization of this work it is demonstrated that polyesters based on polymerization between adipic acid and glycerol can be able to remove sodium from biodiesel

STAGES TO DEVELOP NEXT PERIOD

- KINETIC AND EQUILIBRIUM PROCESS
- TO STUDY CONDITIONS THAT AFFECT ON PURIFICATION PROCESS
- MANUFACTURE OF POLYESTER WITH PREDETERMINATED CHARACTERISTICS TO BIODIESEL PURIFICATION

ACKNOWLEDGMENTS

THIS WORK WAS SUPPORTED FINANCIALLY BY CONICYT-CHILE. (FONDEF D05I10391, FONDECYT POSTDOCTORAL 3090072).

LATINOAMERICANO

Bio refinerías

Materiales y Energ

4, 5 y 6 de mayo de 2009. Concepción, Ch

USE OF POLYESTERS SYNTHERIZED FROM GLYCEROL TO SODIUM REMOTION IN BIODIESEL

CLAUDIO ANDRÉS TORO AEDO

UNIVERSIDAD DE LA FRONTERA