



**Bio Diesel**

**Technological and chemical issues**

Dobrin Dobrev, D.Sc.



# Contents

- The biodiesel chemical formula
- Production methods
  - Esterification of free fat acids
  - Transesterification of vegetal and animal oils and fats
- Technological problems

# What is biodiesel

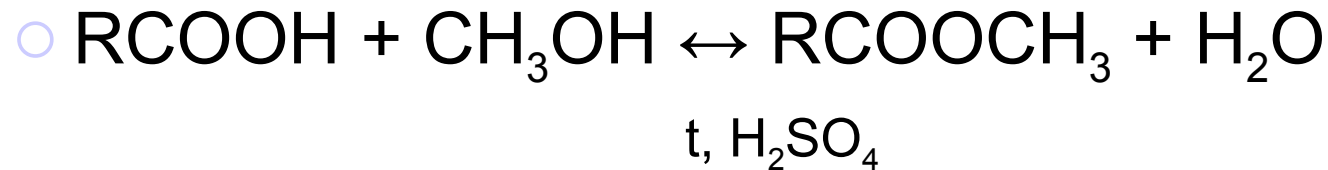


- Methyl esters of fat acids of the type  $\text{RCOOCH}_3$
- $\text{R} - \text{C}_{17}\text{H}_{(25-2a)}$ 
  - 'a' is the number of the double junctions

# Production methods



- 1. Esterification of free fat acids

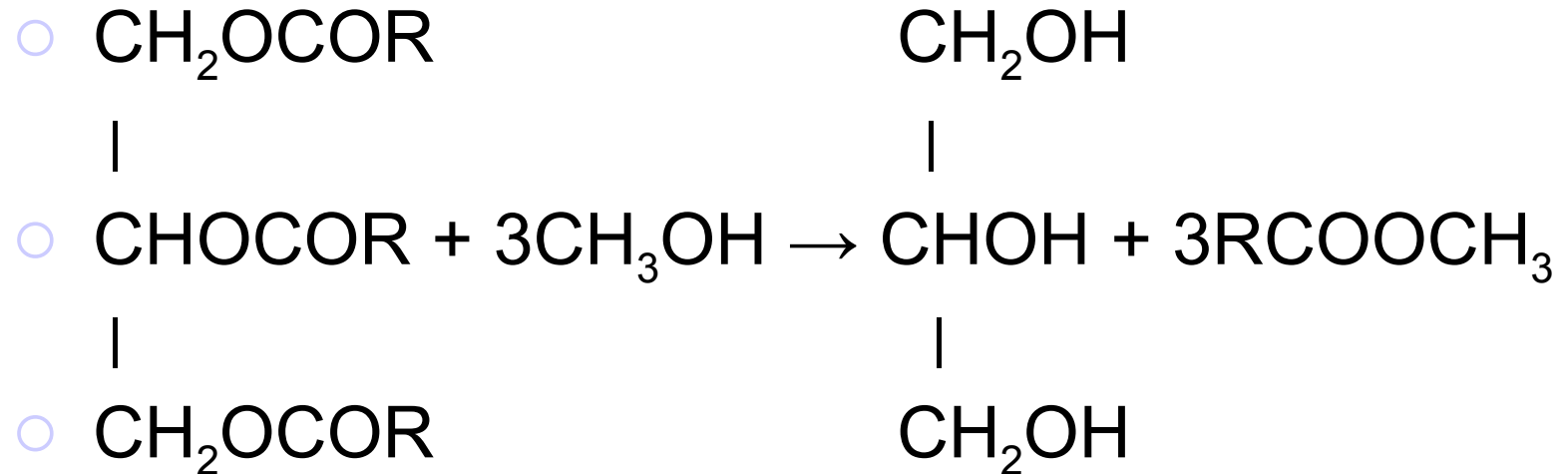


- Problems:

- Special equipment is needed
- High acid consumption
- Resin content of the end product

# Production methods

- 2. Transesterification of vegetal and animal oils and fats



# Production methods



- Catalysts:
  - Strong acids ( $\text{H}_2\text{SO}_4$ , HCL, p-toluensulfon acid, etc.)
  - Strong bases (KOH, NaOH,  $\text{Ca}(\text{OH})_2$ )
  - High temperature (above  $200^\circ \text{C}$ )
  - High pressure (in order to keep the methanol in liquid phase)

# Production methods



- For industrial purposes is used transesterification with alkaline catalysts (KOH or NaOH).
- The reaction is conducted at boiling temperature of the methanol, 0.5% - 1% alkaline catalyst and excess of methanol.

# Technological problems



- Raw material quality
  - Water content
  - Content of free fat acids
- Reaction equipment