바이오매스 전환기술

바이오매스: 재생가능물질 중 액체수송연료를 합성할 수 있는 유일한 물질

에탄올

- 옥수수, 발효곡물
- 셀룰로오스:switchgrass, corn stover, wood
- 고체 폐기물

바이오디젤

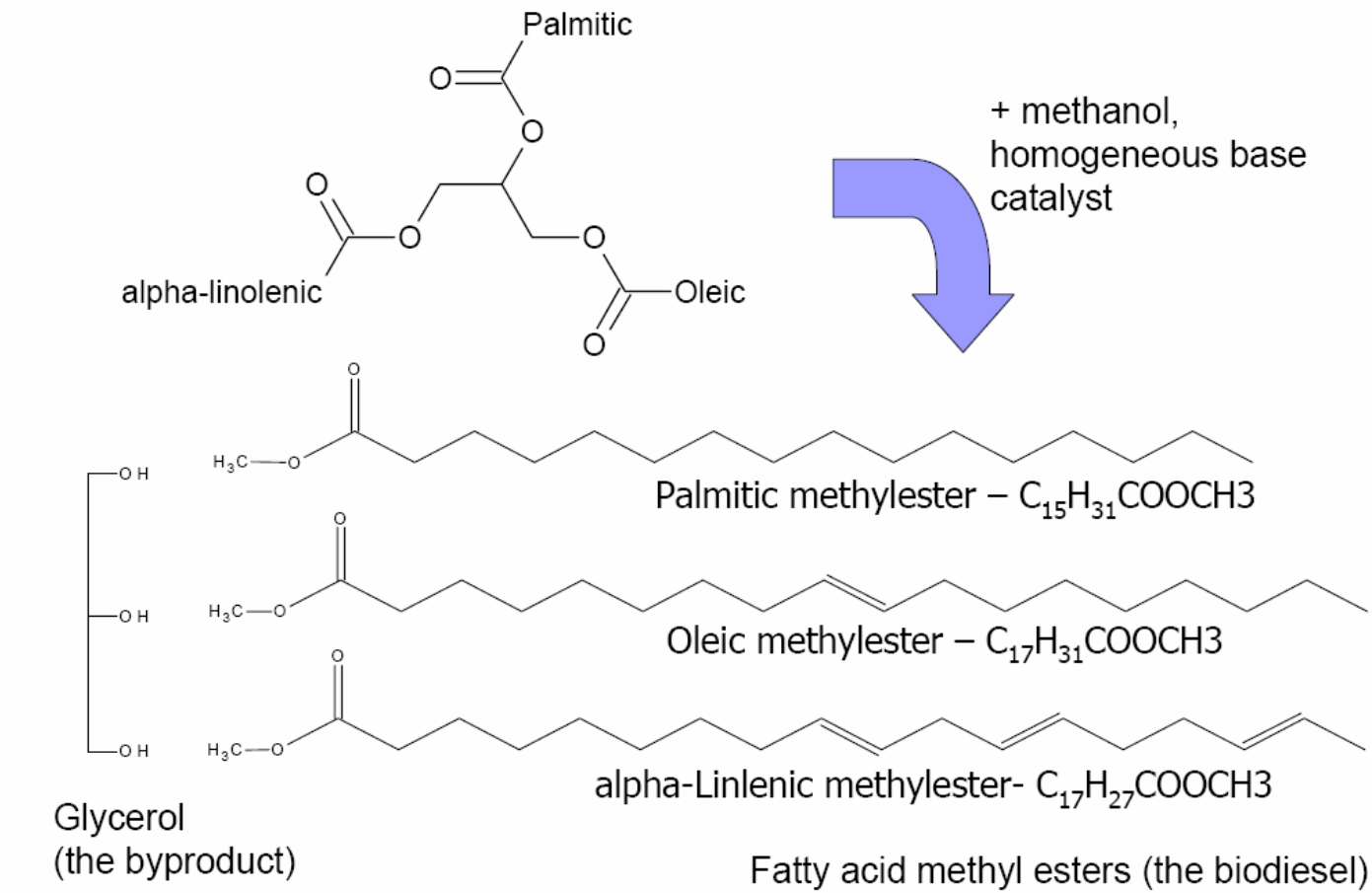
- 식물성 기름
- 동물성 지방
- 폐식용유

가솔린

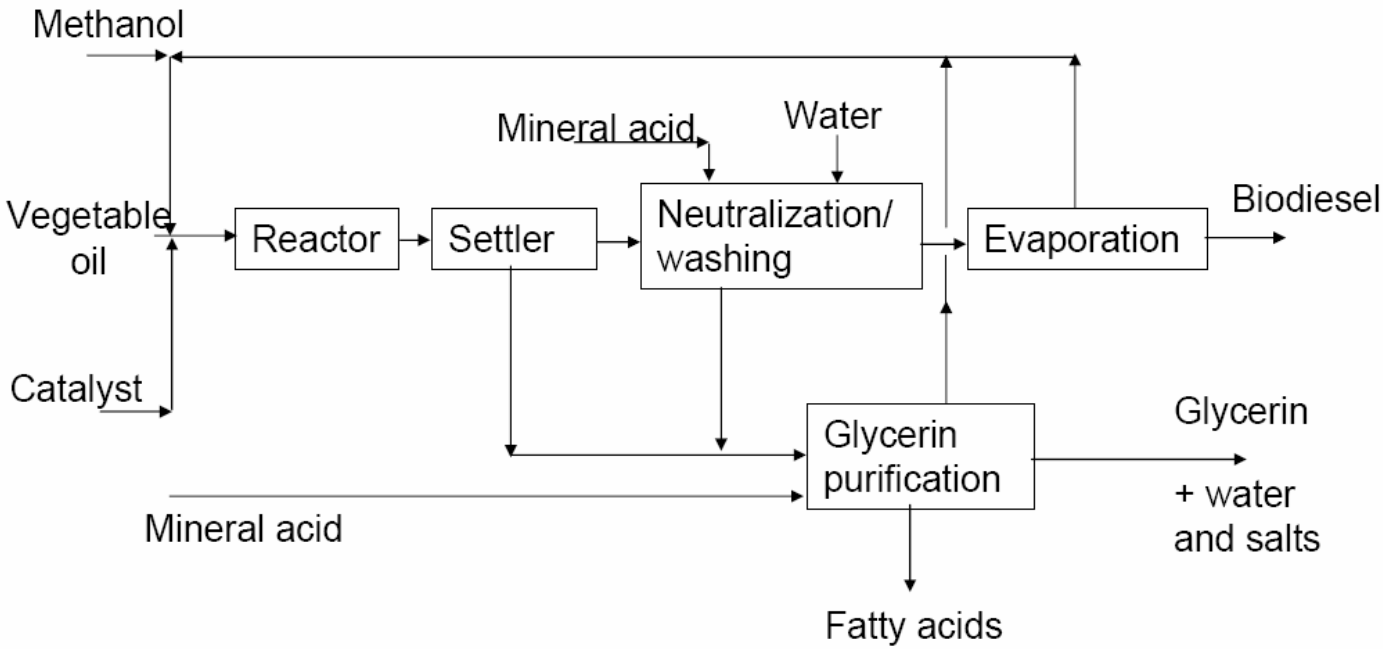
바이오연료 전환기술

- Biodiesel
  - Transesterification with methanol
  - Hydroprocessing
  - Deoxygenation
- Ethanol
  - Fermentation
  - Cellulose to ethanol
  - Gasification-fermentation
  - Other alcohols
- Gasoline

바이오디젤: 트리글리세리드를 FAME로 전환



전형적인 전이에스테르화 반응



현기술의 특징

- Well established, high conversion
- Multiple scales, batch or continuous
- Homogeneous (base) catalyzed conversion
  - Produces soaps
  - Requires a water washing step
  - Raw oil needs to be refined
    - <0.5% FFAs, <0.5% water
  - Significant volume byproduct (glycerol)
- Diesel characteristics
  - Good cetane number
  - Superior emissions
  - Stability (oxidation) issues
  - Cloud point and pour point higher than desirable

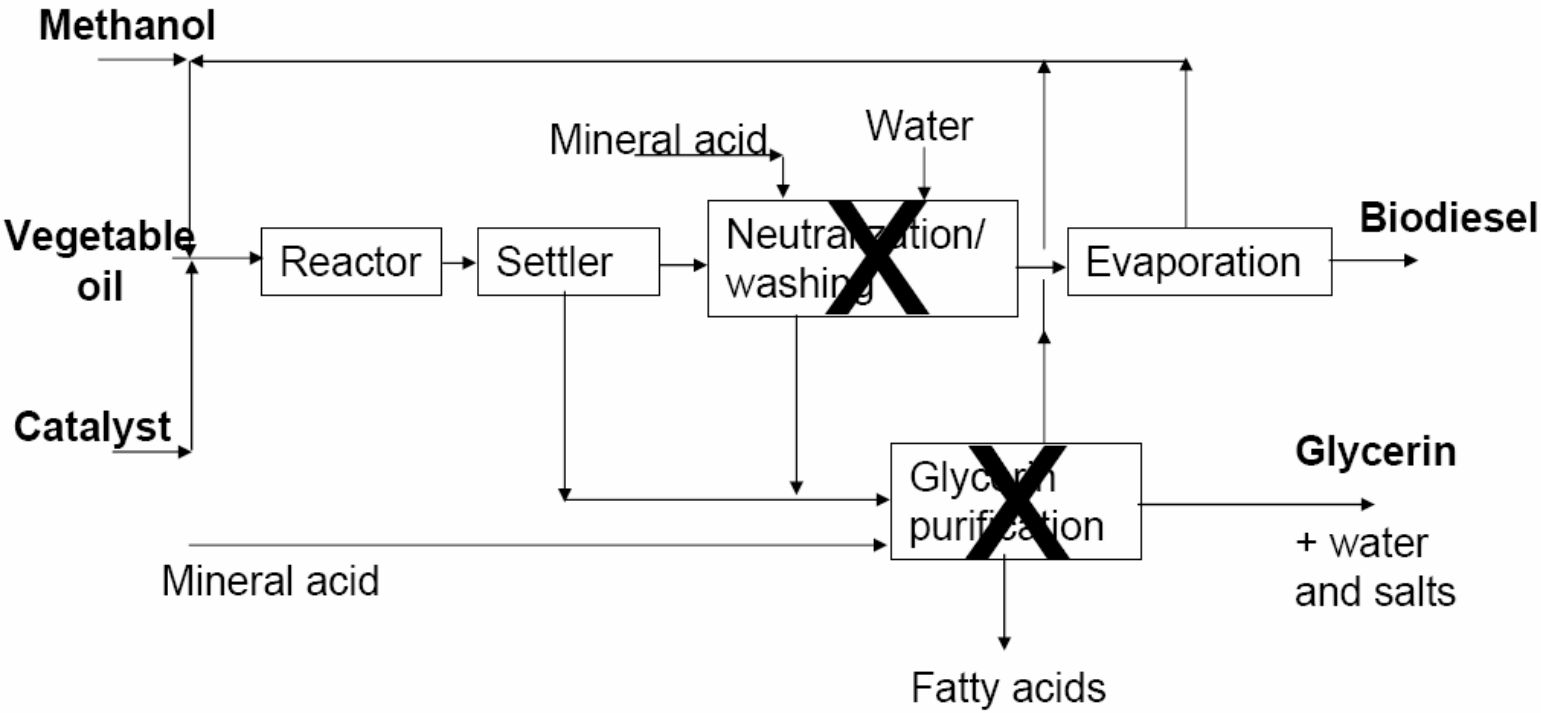
개선해야할 사항

- Waste reduction
- Byproduct elimination or utilization
- Process simplification
- Improved biodiesel properties
  - Low temperature properties
  - Stability for storage
  - Existing fuels infrastructure compatibility

바이오디젤에서 필요한 추가 사항

- Heterogeneous catalytic transesterification
  - Reusable catalyst
  - Little to no saponification
  - Easy separation of glycerol (no washing)
  - Higher purities of glycerol (commercial grade)
- Triglyceride or FAME processing
  - Partial or complete double bond saturation via hydrotreating
  - Decarboxylation

비균일 전이에스테르화 반응



에스테르화반응 대체용
촉매 탈산소반응과 수소화반응

- Catalytic decarboxylation (removal of oxygen in the form of CO_2)
- Hydrogenation to saturate double bonds
- Hydrotreating to remove oxygen as water
- Hydrocracking to decrease carbon chain length

액체연료 합성 대안

- Gasoline from oxygenates
  - Glycerol, alcohols from biofuels processes
- Biofuels from syngas (CO plus H_2)
  - Syngas via biomass gasification
  - Alcohols (OSU process)
  - Fischer-Tropsch (catalytic diesel production)
  - Gasoline (via oxygenates-to-gasoline catalytic processes)