Colorimetry of Biodiesel Blends for Possible Quick Concentration Detection

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The Need

- Quick determination of the blend of biodiesel in diesel fuel is a critical need in the biodiesel industry
- Such a method is beneficial to
  - Engine manufacturers
  - Consumers
  - Biodiesel producers

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Fuel Blend Detection

- **In alcohol-gasoline blend detection, optical and dielectric effect methods are used**
- **Optical methods**
  - Simple & easy to use
  - Quick
  - Too sensitive to contaminants
- **Dielectric methods**
  - More accurate
  - More complicated

Biodiesel Blend Sensors

- Biodiesel Blend Detection Using a Fuel Composition Sensor *(Tat & Van Gerpen, 2001)*

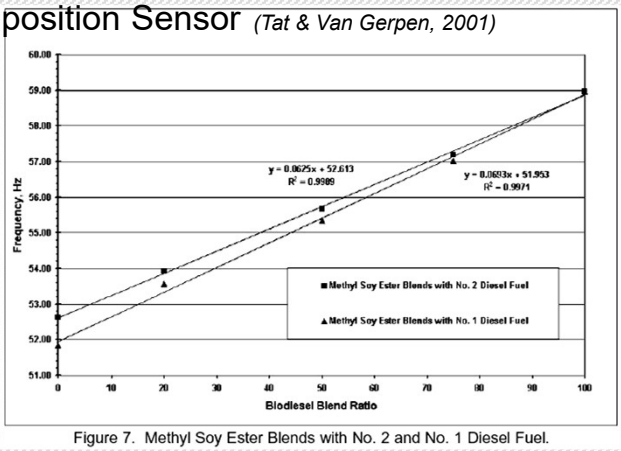

Figure 7. Methyl Soy Ester Blends with No. 2 and No. 1 Diesel Fuel.

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Purpose of This Study

- To test the feasibility of quick determination of blend of biodiesel in diesel fuel using colorimetry method

Method

- Biodiesel of Mustard Methyl Esters (MEE) was used as the working media
- Cuvettes of metacrylate from Fisher was used for samples *(disposable standard 10x10mm)*
- Beckman DU520 spectrophotometer was used for the colorimetry measurements

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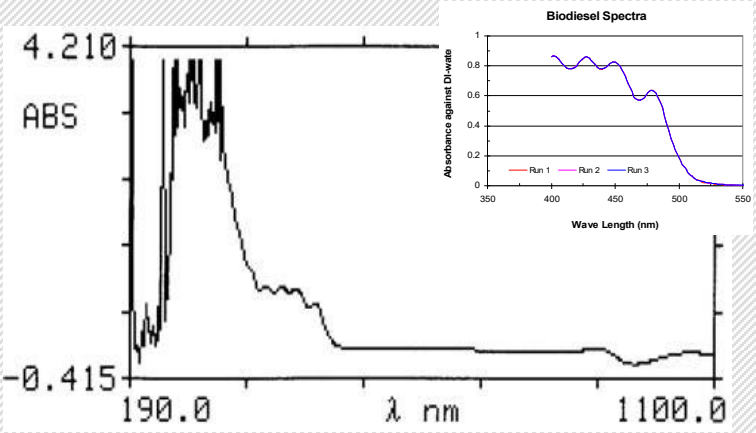
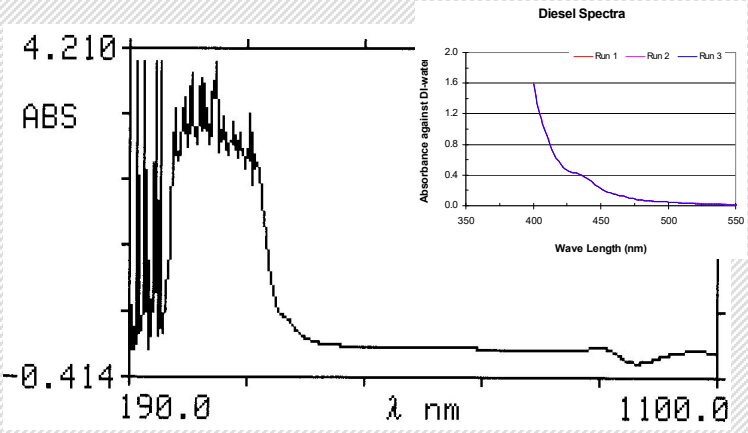
Preliminary Results

- Scan spectrum of biodiesel at 190-1100 nm



Preliminary Results

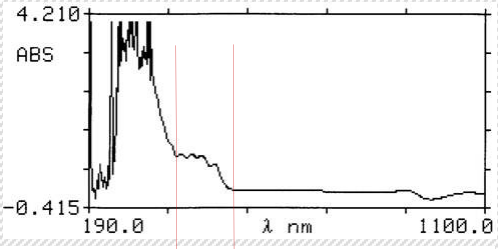
- Scan spectrum of diesel at 190-1100 nm



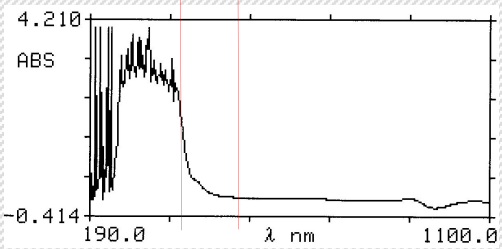
Preliminary Results

- Scan spectra of biodiesel and #2 diesel

Biodiesel (MEE)



Diesel (#2 ultra-low)



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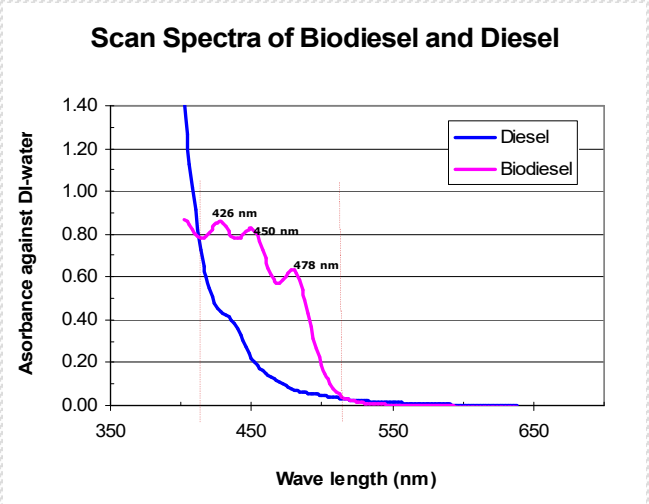

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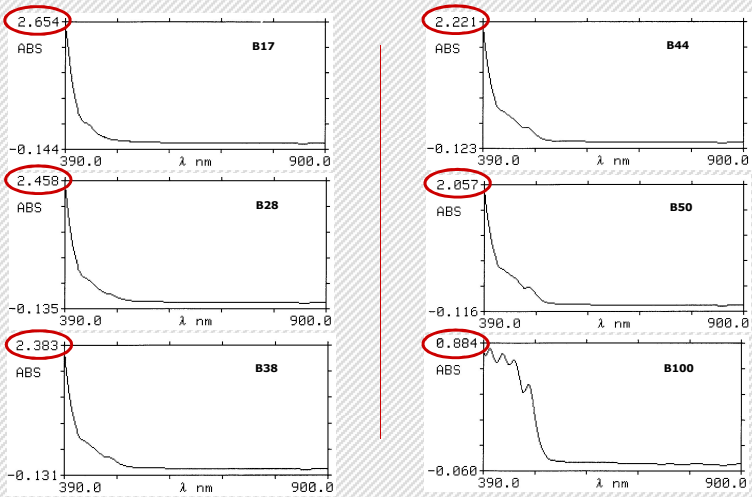

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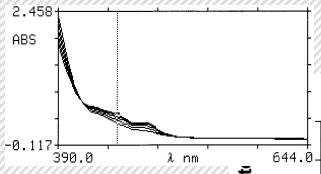

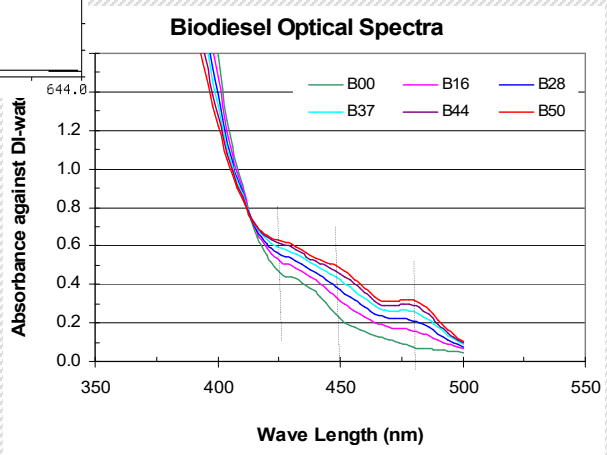

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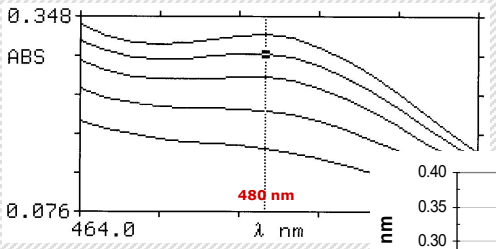

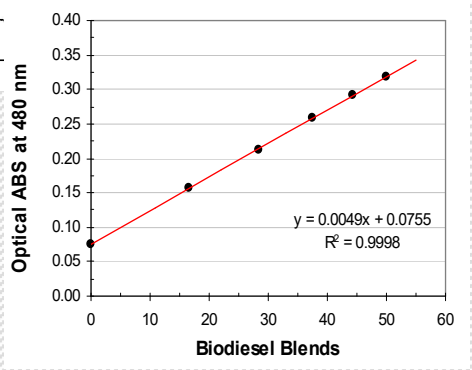

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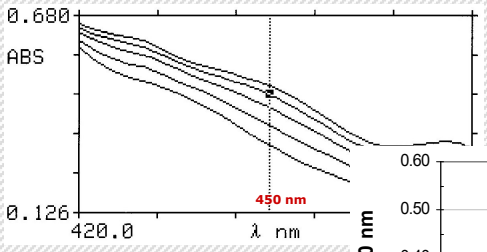

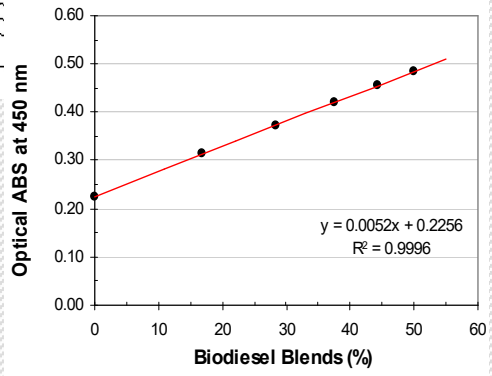

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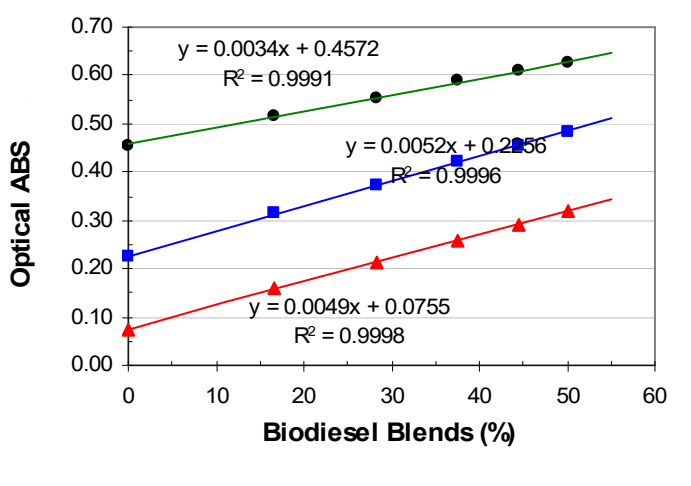

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Summary

- **Biodiesel has characteristic optical absorbance peaks at 426, 450, and 480 nm**
- **Dielectric methods**
  - More accurate
  - More complicated
- **ABS at 450nm be the representative index**
  - ΔABS = 0.410 at 426 nm
  - ΔABS = 0.603 at 450 nm
  - ΔABS = 0.562 at 480 nm

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Summary

- **Colorimetry method is feasible for MEE biodiesel blend detection**
- **More tests need to be done on**
  - Different feedstock, e.g., rape, mustard, canola, soybean, *etc*.
  - Methyl esters of the same
  - Same feedstock of different sources
  - Sensitivities to impurity, e.g., water, glycerol, *etc*.
  - ???

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