

Biodiesel- Do You Really Want to Know What Is in It?

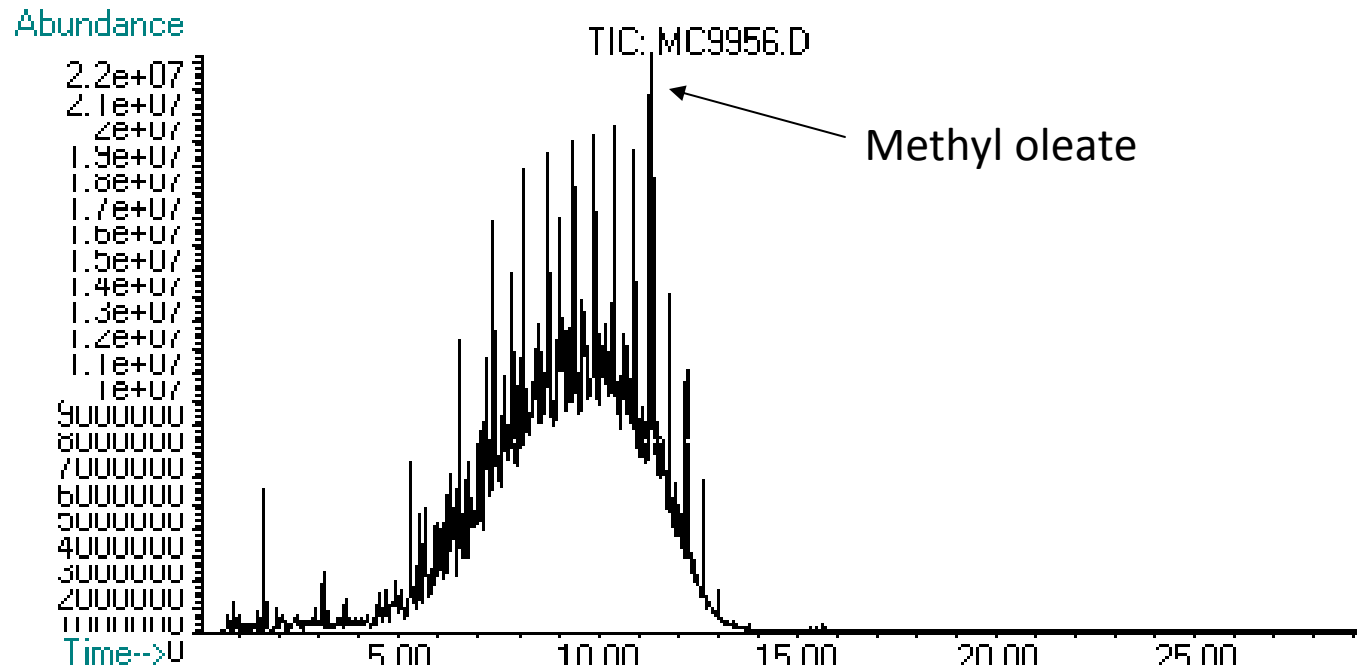
Michael Cheng

Chevron Energy and Technology Company

Doug Stevens

Waters

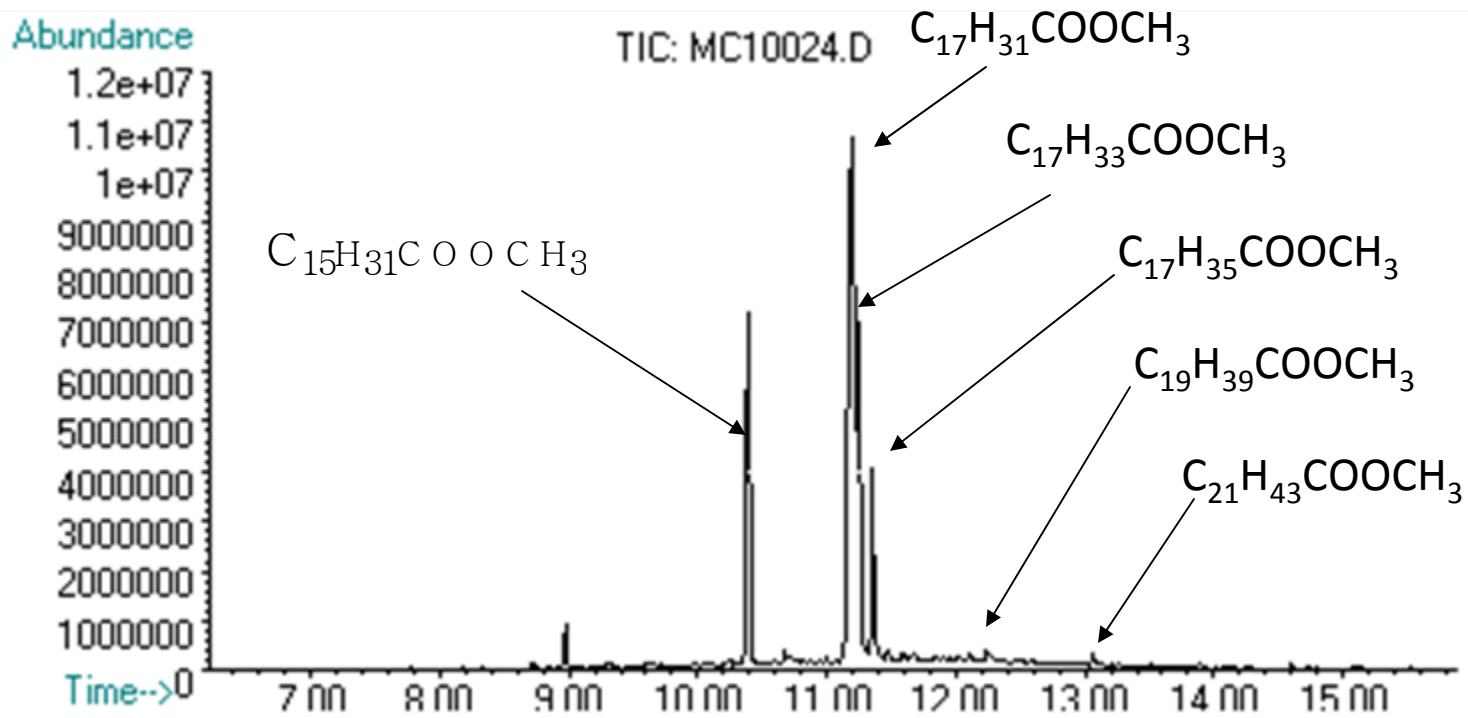
GCMS Trace of a B5 Sample



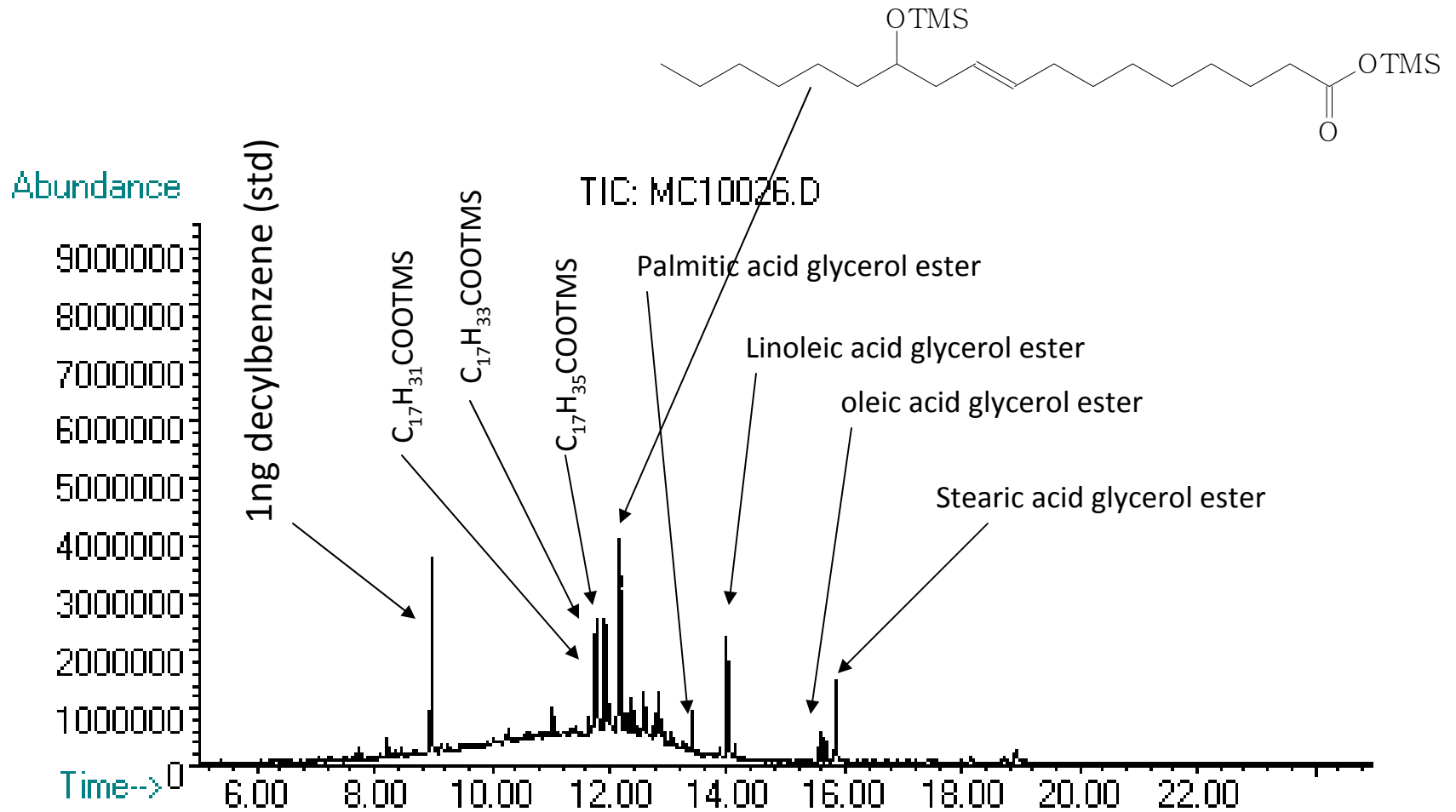
B5 fractionated on a silica gel column into four fractions – increasing polarity:

1. Petroleum diesel compounds
2. Methyl ester from bio diesel
3. Diglycerides and triglycerides
4. Fatty acids, monoglycerides, and sterols

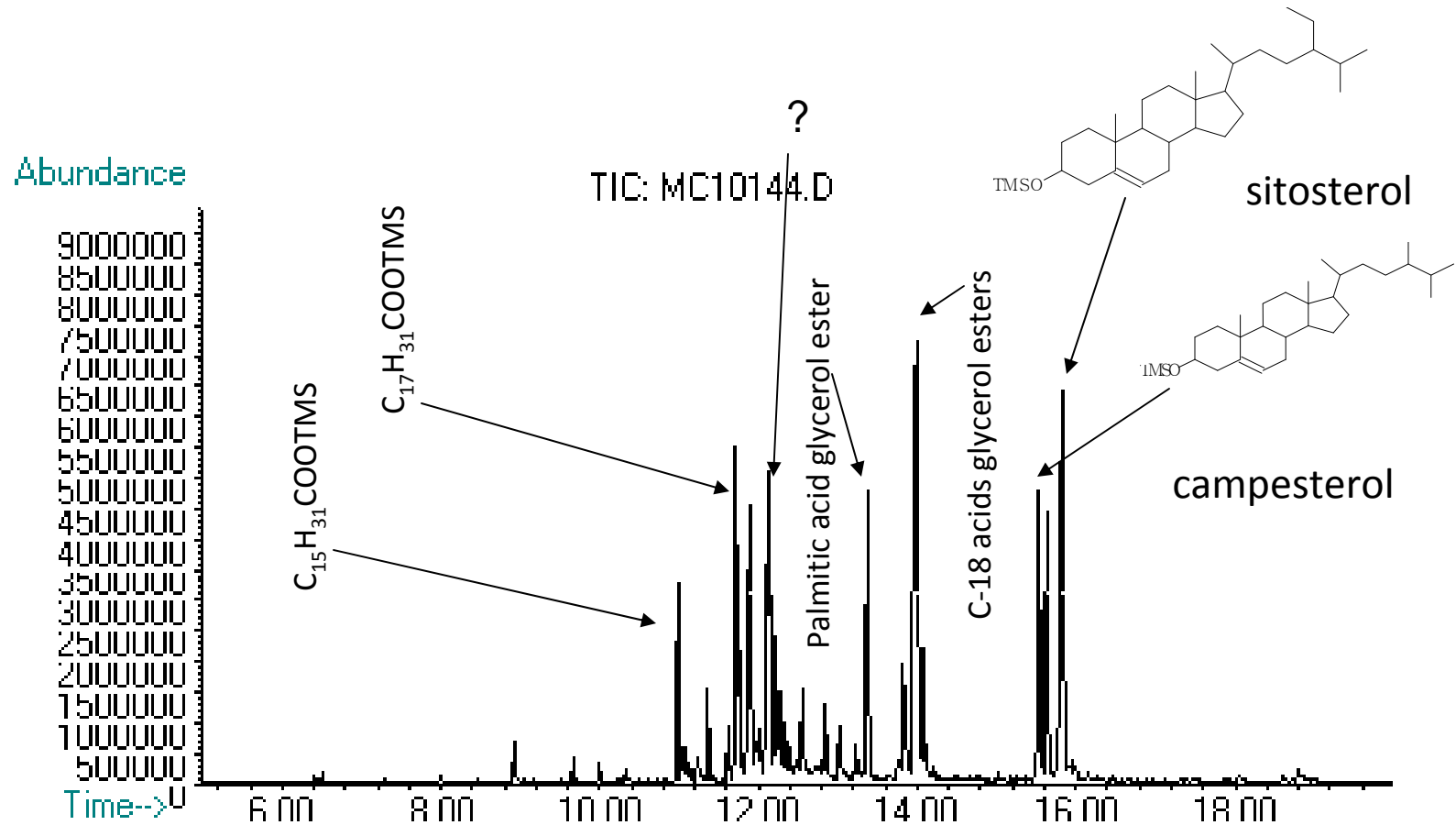
GCMS Trace of the Second Fraction of the Bio-Diesel Blend



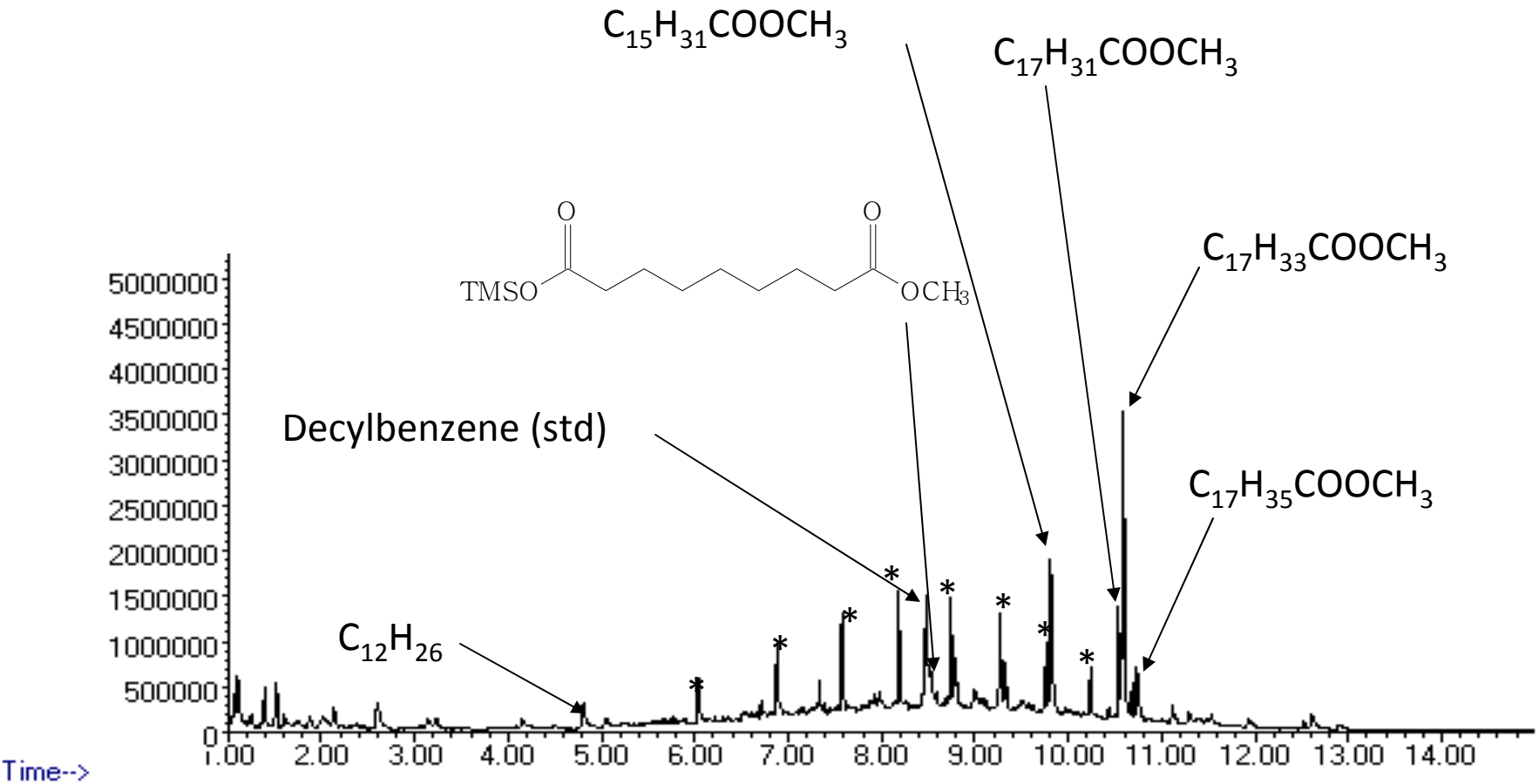
GCMS Trace of the Most Polar Fraction of the Bio-Diesel Blend



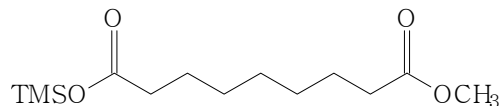
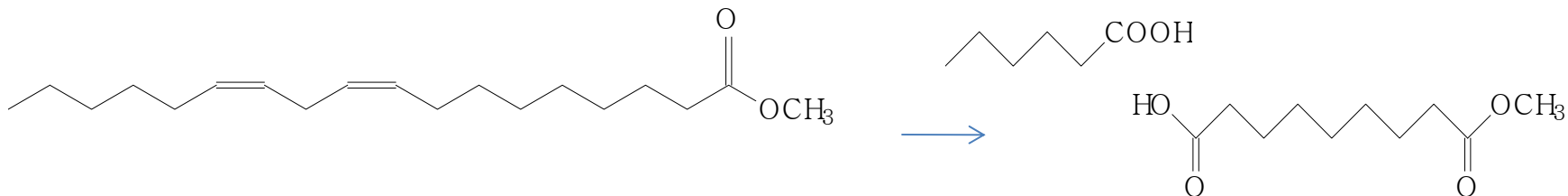
GCMS Trace of the Most Polar Fraction of the Pure Bio-Diesel



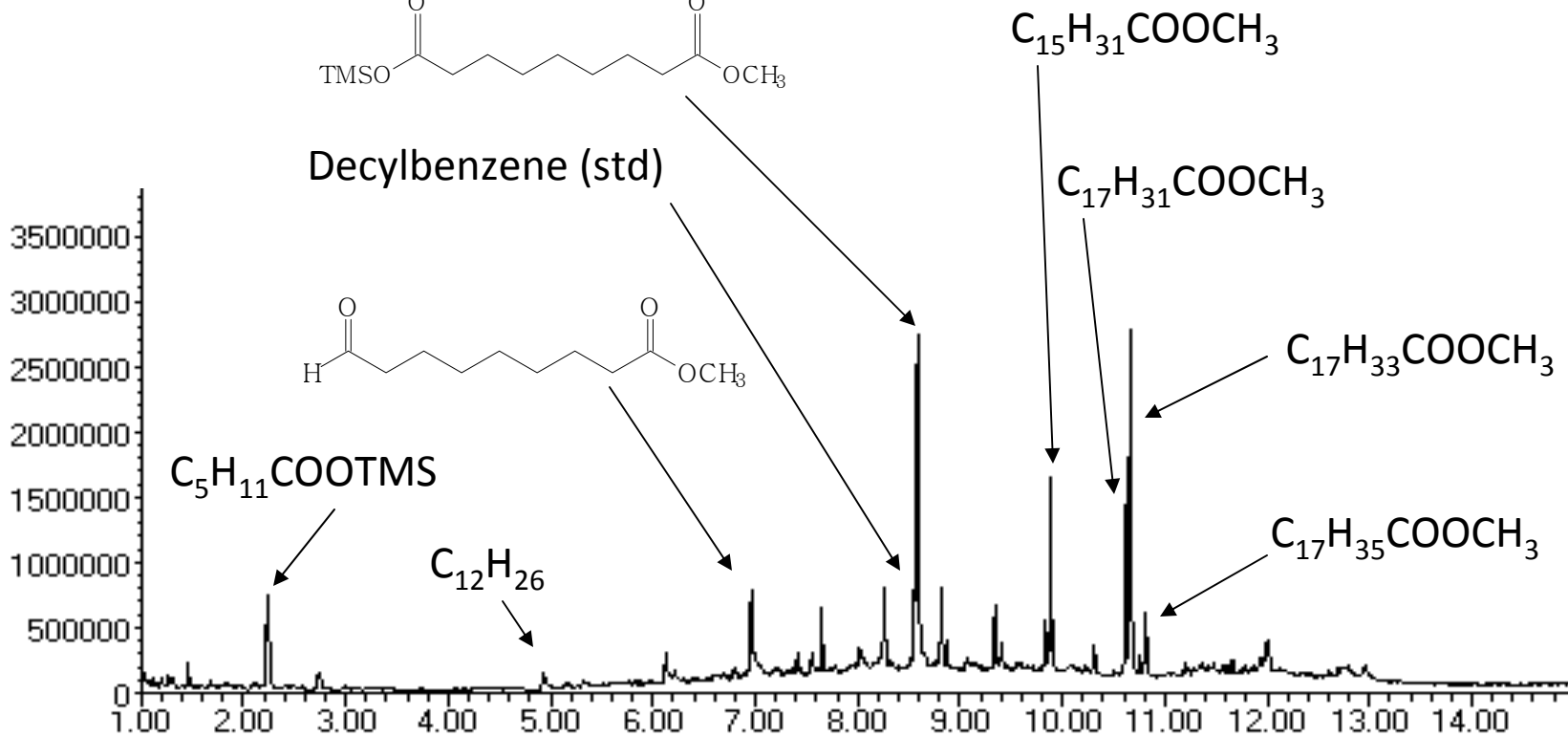
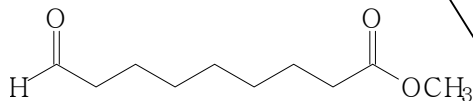
GCMS Trace of Top Layer of B20 with Soy Methyl Esters,
Stored at 43C for 13 Weeks



GCMS Trace of Bottom Layer of B20 with Soy Methyl Esters,
 Stored at 43C for 13 Weeks

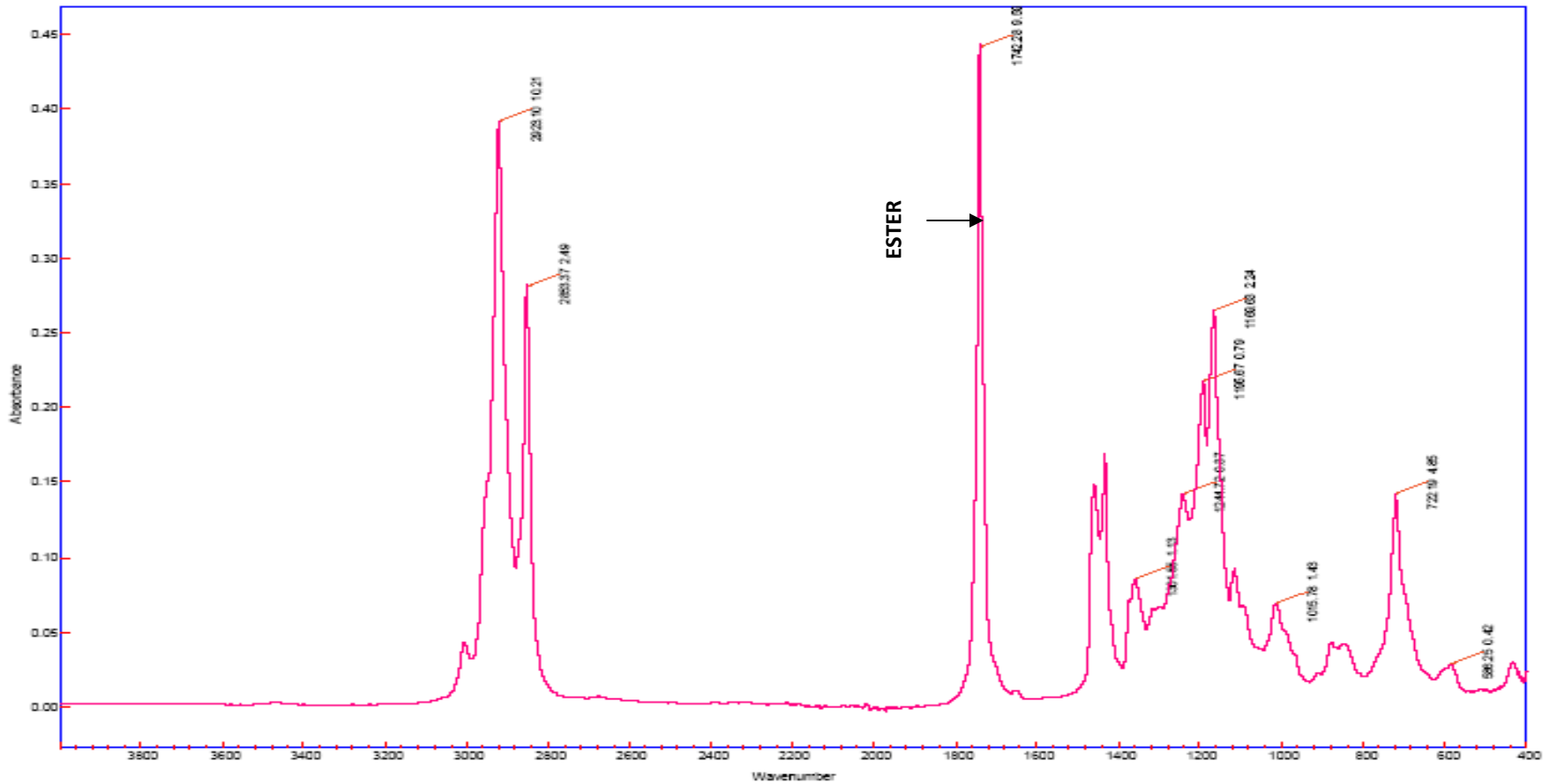


Decylbenzene (std)

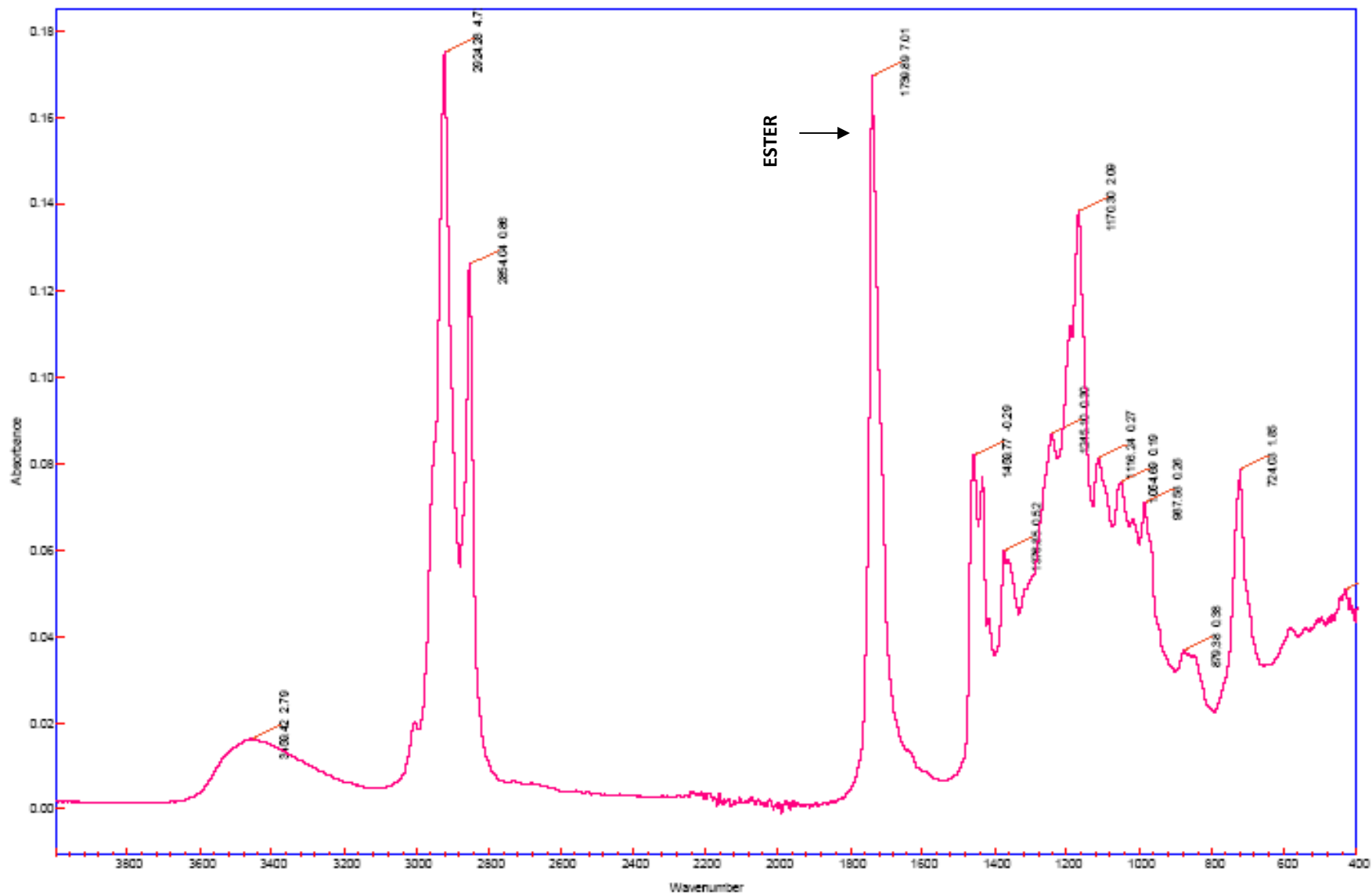


Time-->

IR Spectrum of Whole Tallow Biodiesel A

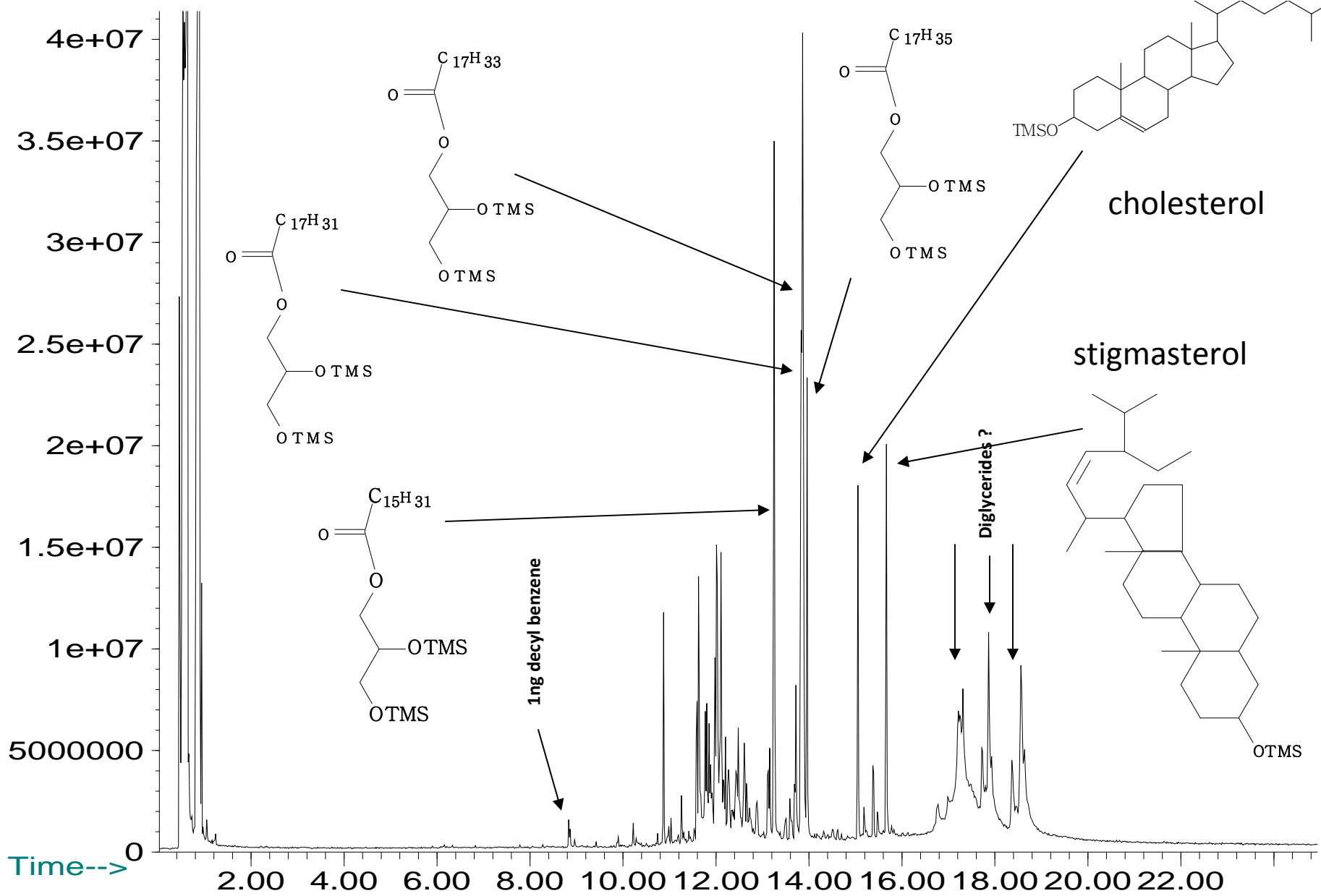


The Most Polar Fraction of Tallow Biodiesel A



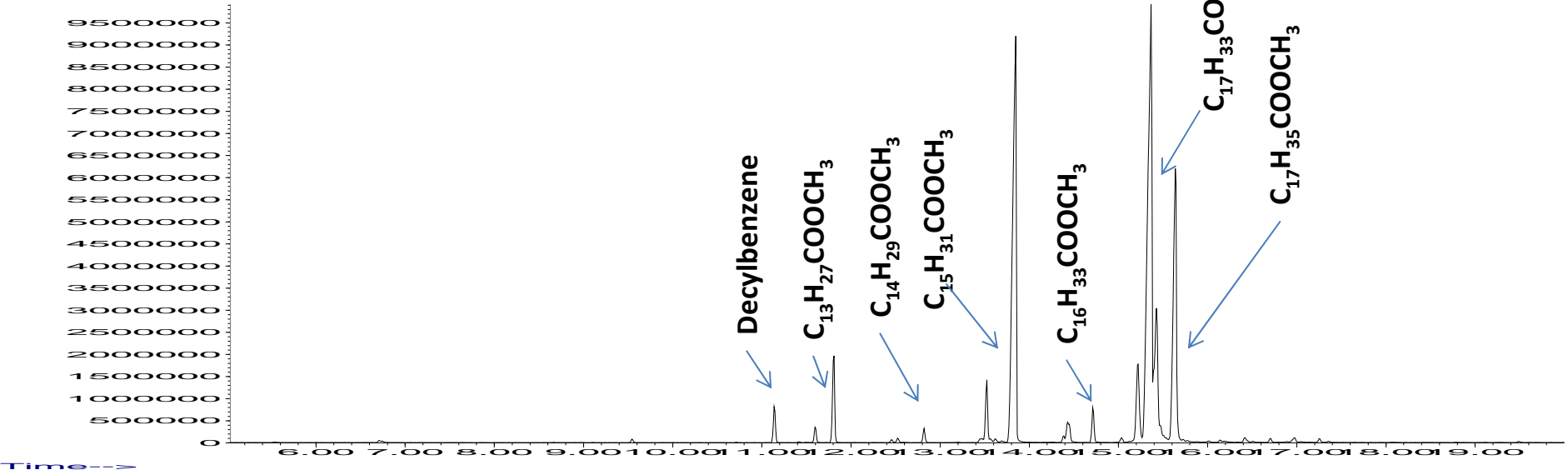
Abundance

The Most Polar Fraction of Tallow Biodiesel A

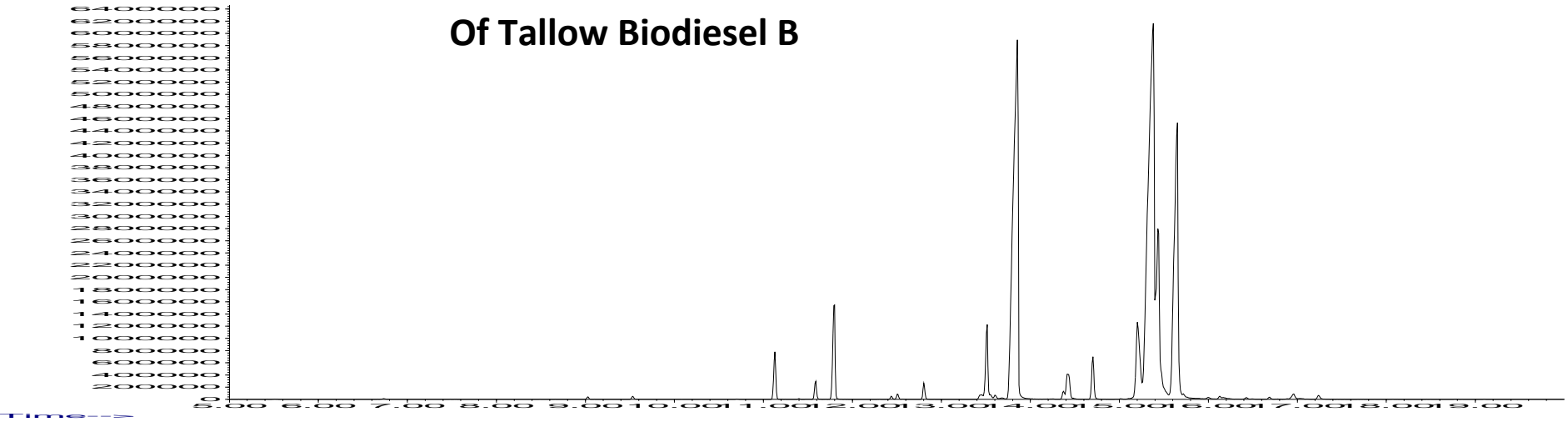


Time-->

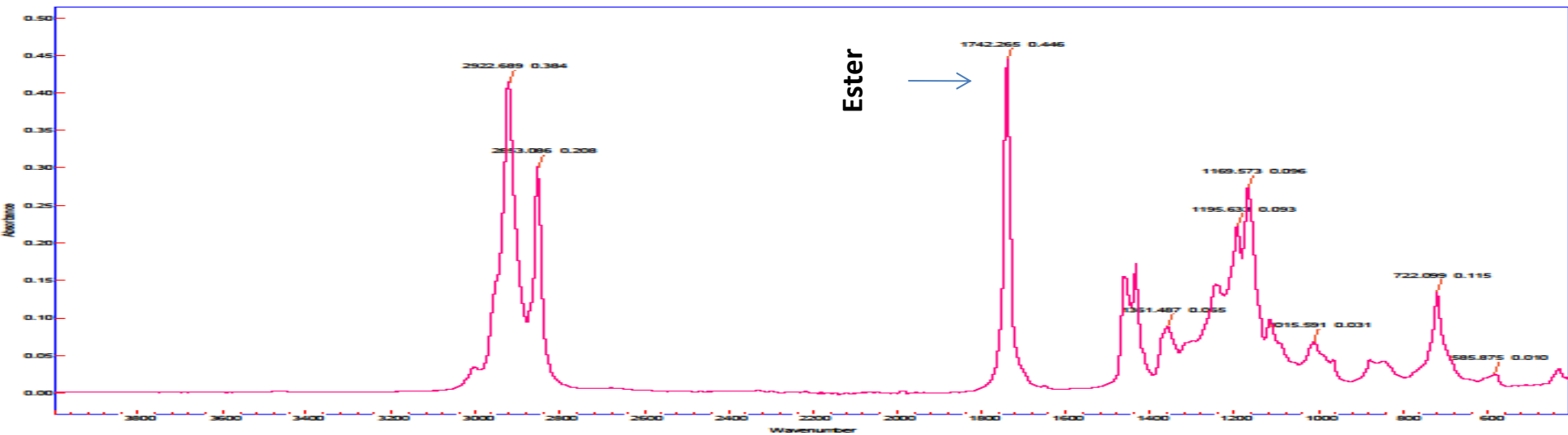
GCMS Trace of Whole Tallow Biodiesel B



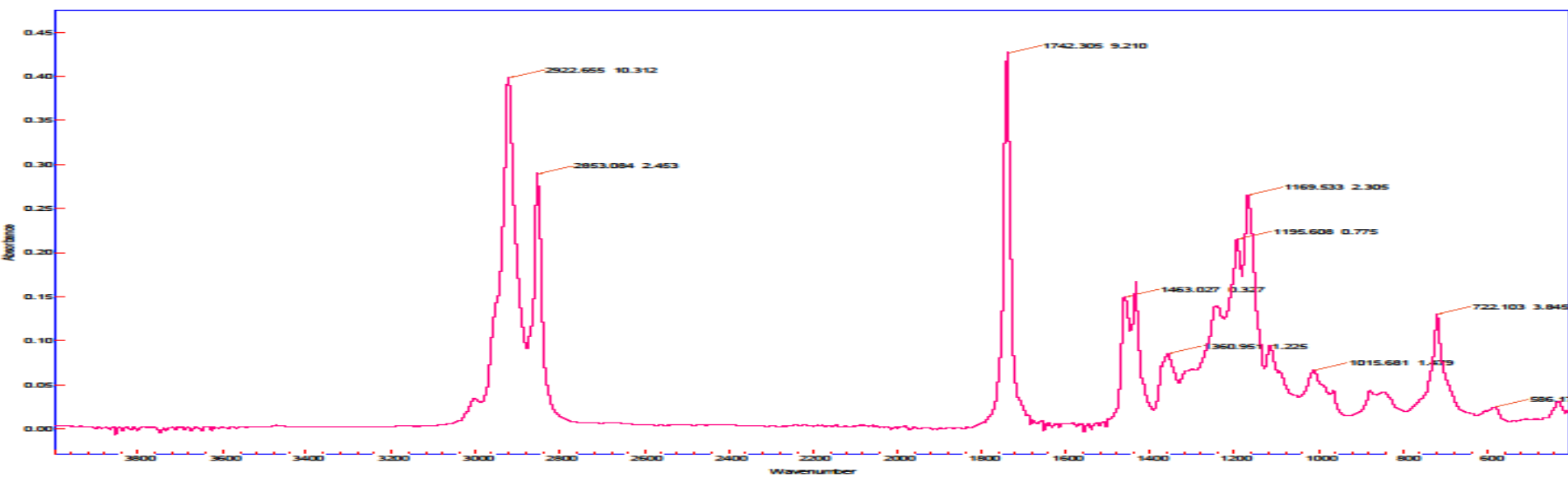
GCMS Trace of Second Fraction Of Tallow Biodiesel B



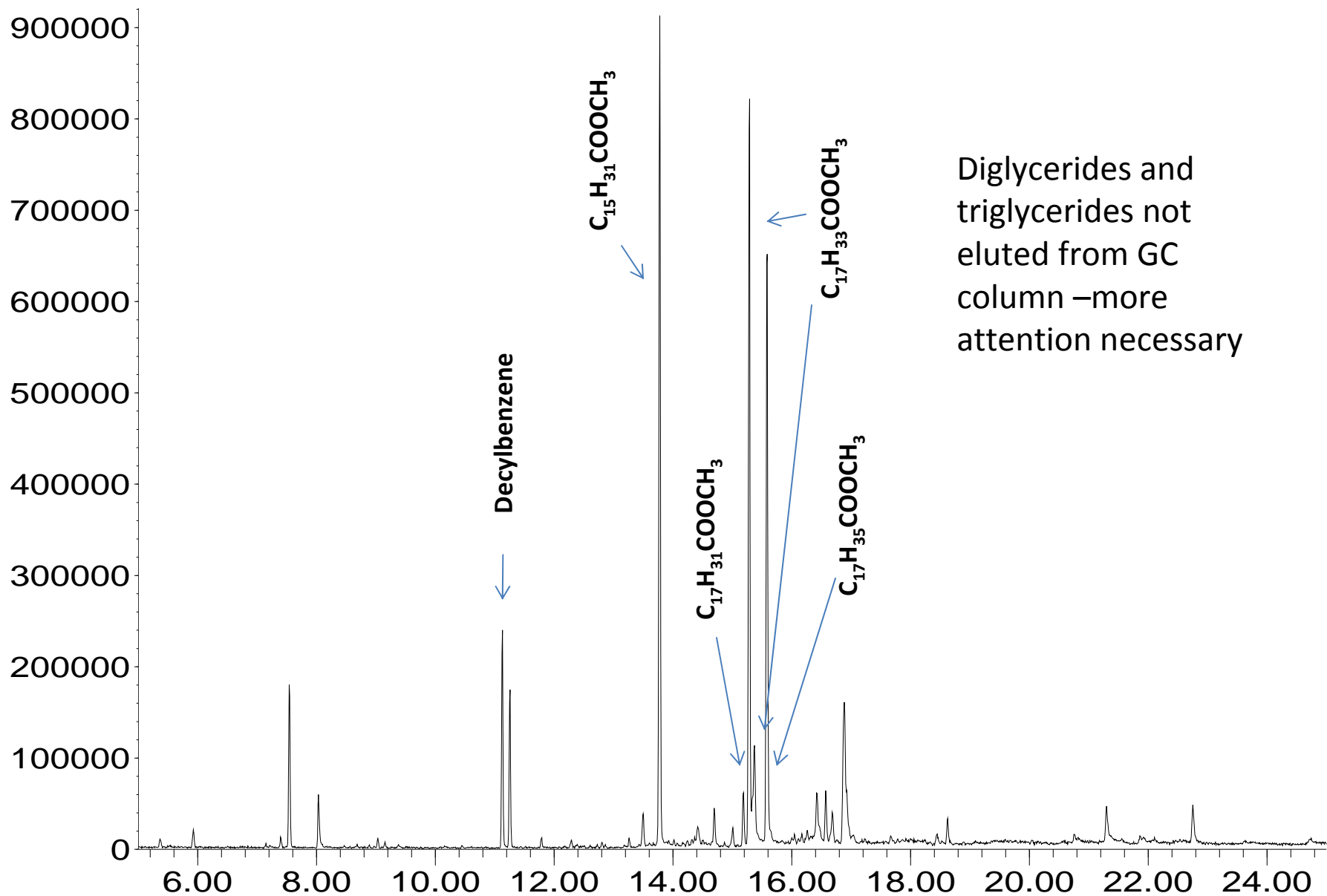
IR Spectrum of Whole Tallow Biodiesel B



IR Spectrum of Second Fraction of Tallow Biodiesel B



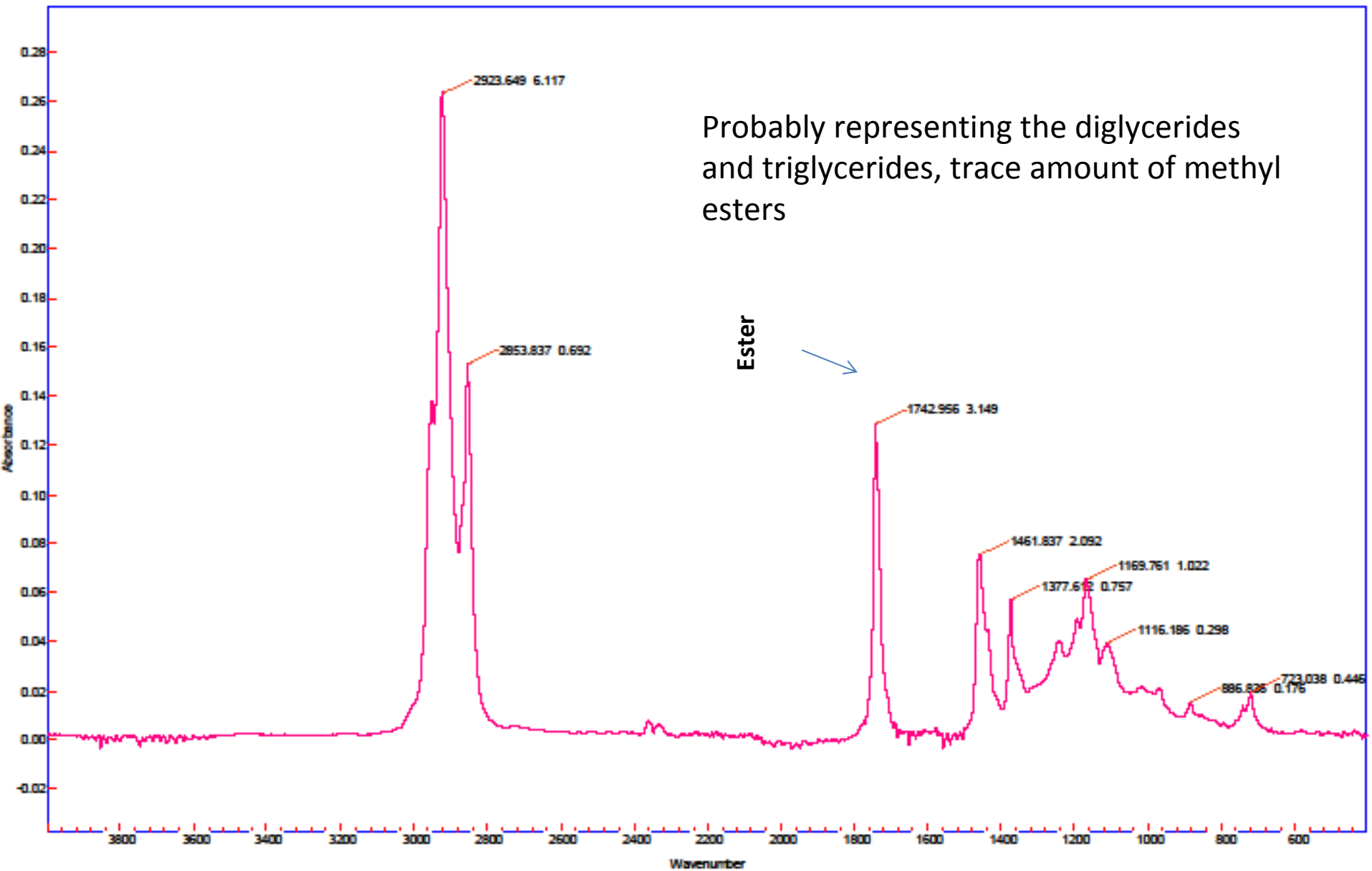
GCMS Trace of Third Fraction of Tallow Biodiesel B



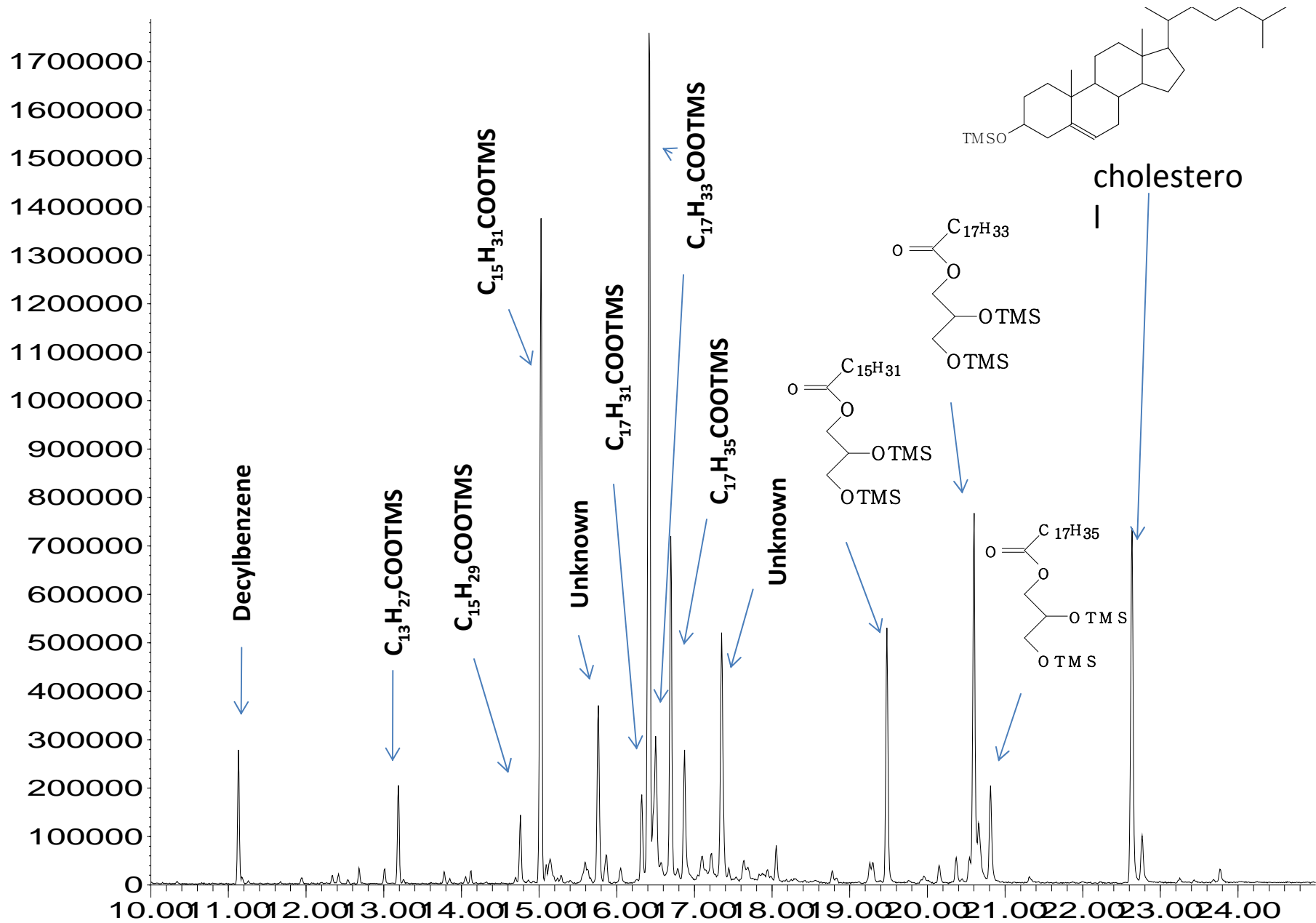
Diglycerides and triglycerides not eluted from GC column –more attention necessary

Time-->

IR Spectrum of Third Fraction of Tallow Biodiesel B



GCMS Trace of the Fourth Fraction of Tallow Biodiesel B

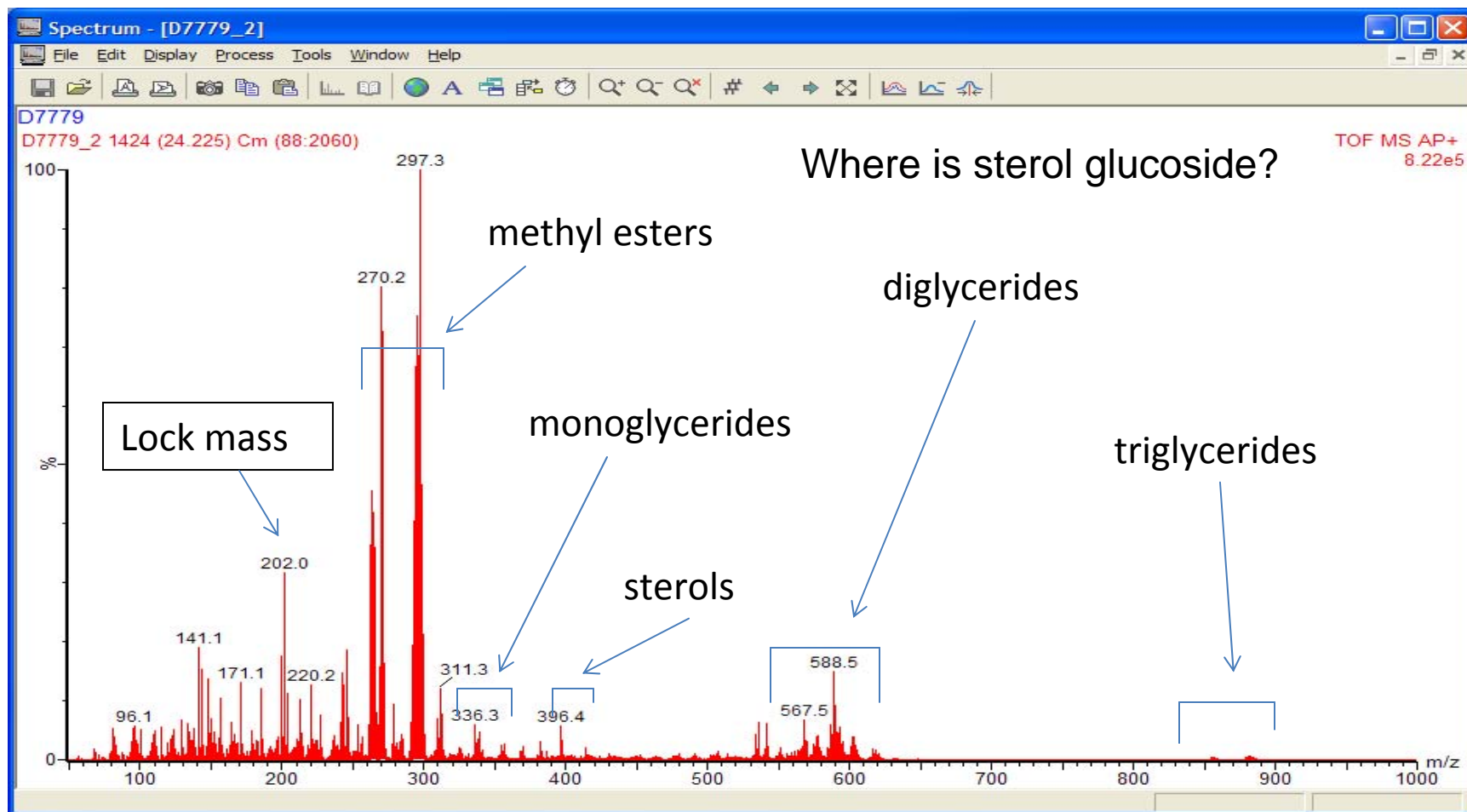


Time-->

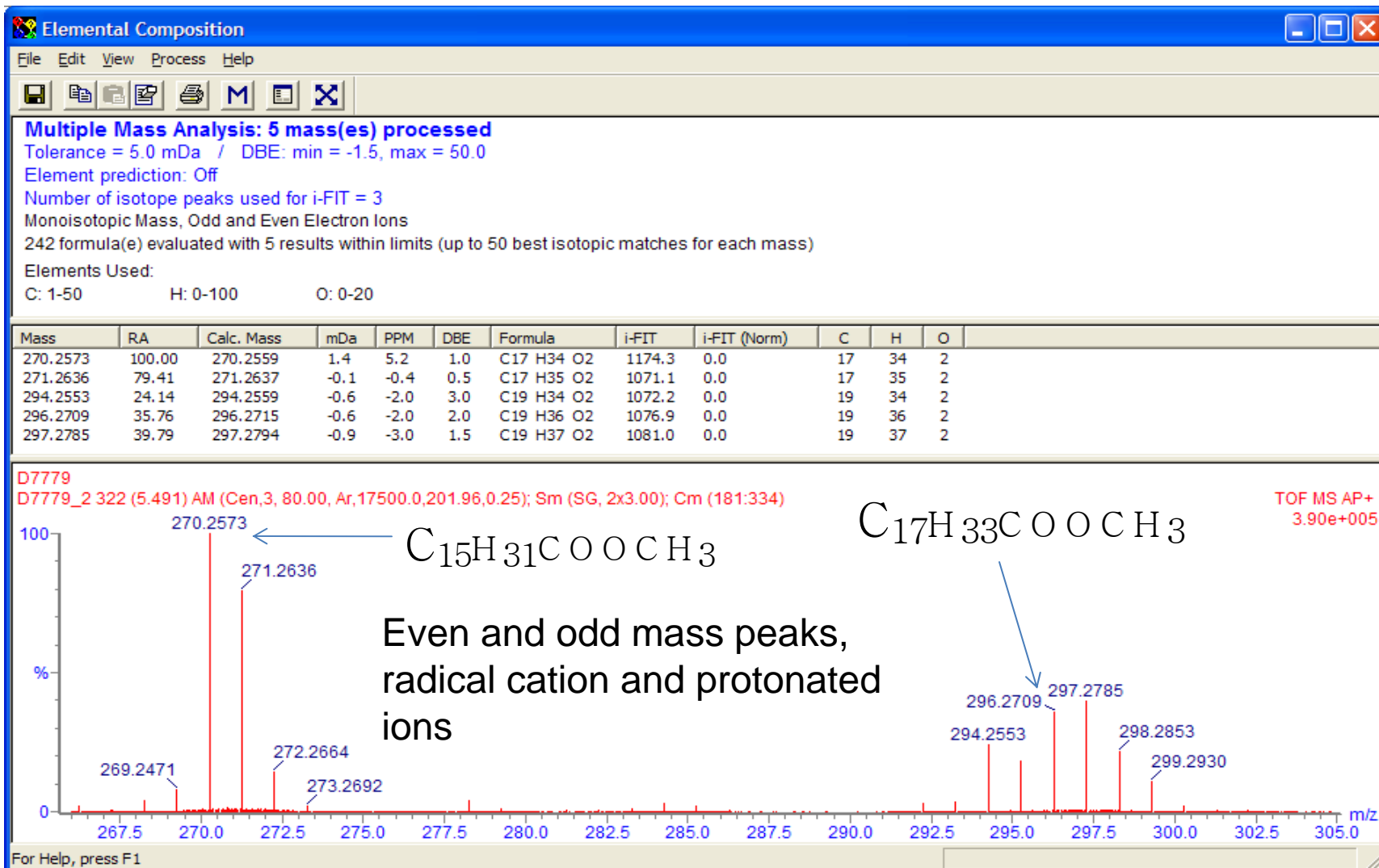


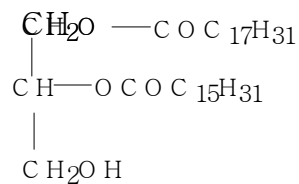
ASAP
PROBE
ON
SYNAPT

Tallow Full Mass Range

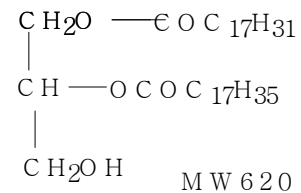


Accurate Mass of the Major Peaks – Methyl Esters



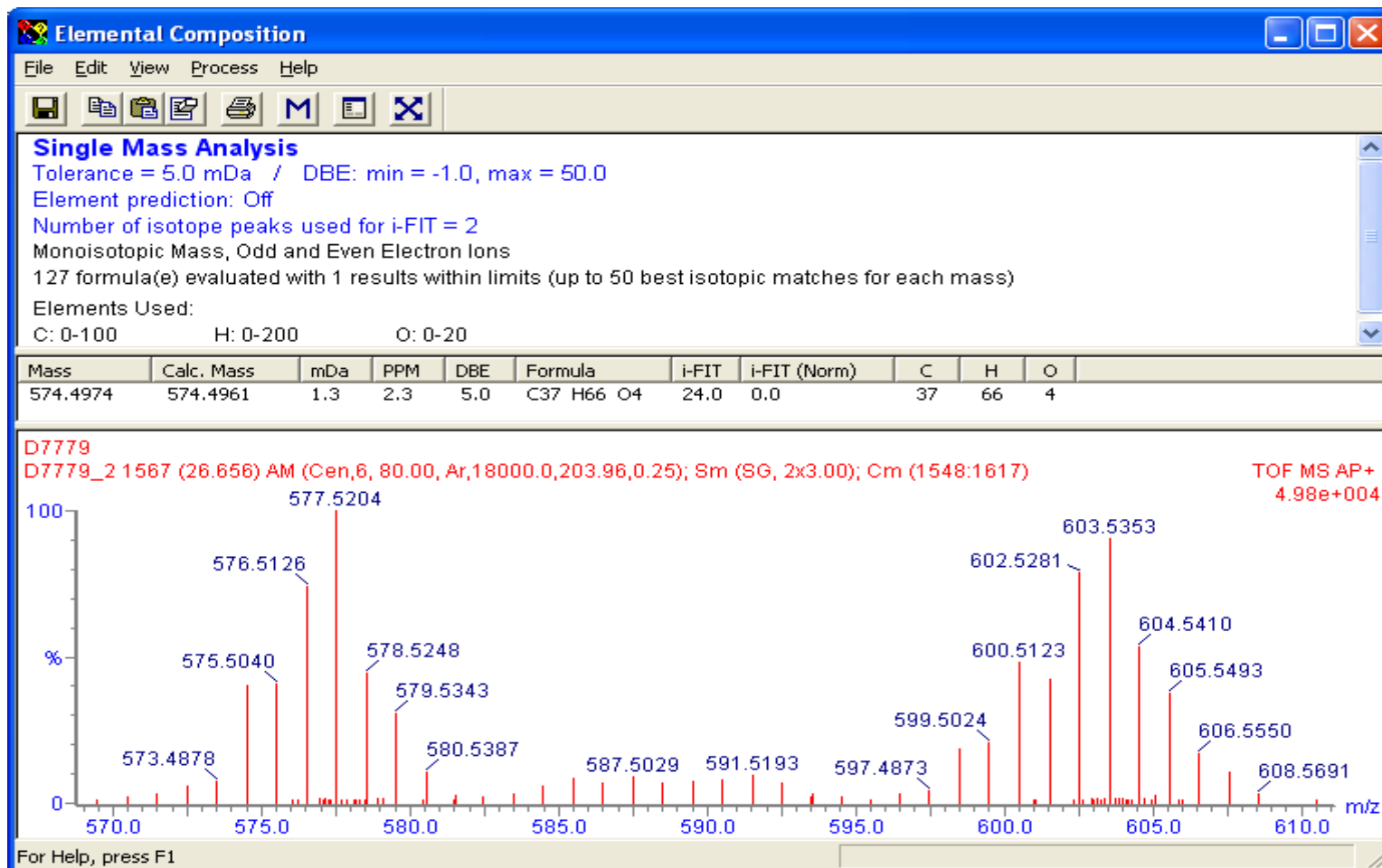


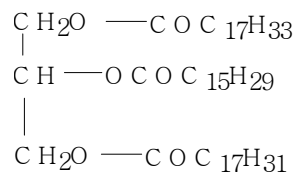
MW 592



MW 620

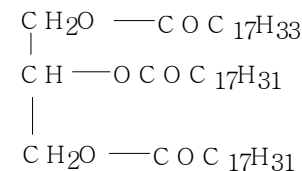
Diglycerides



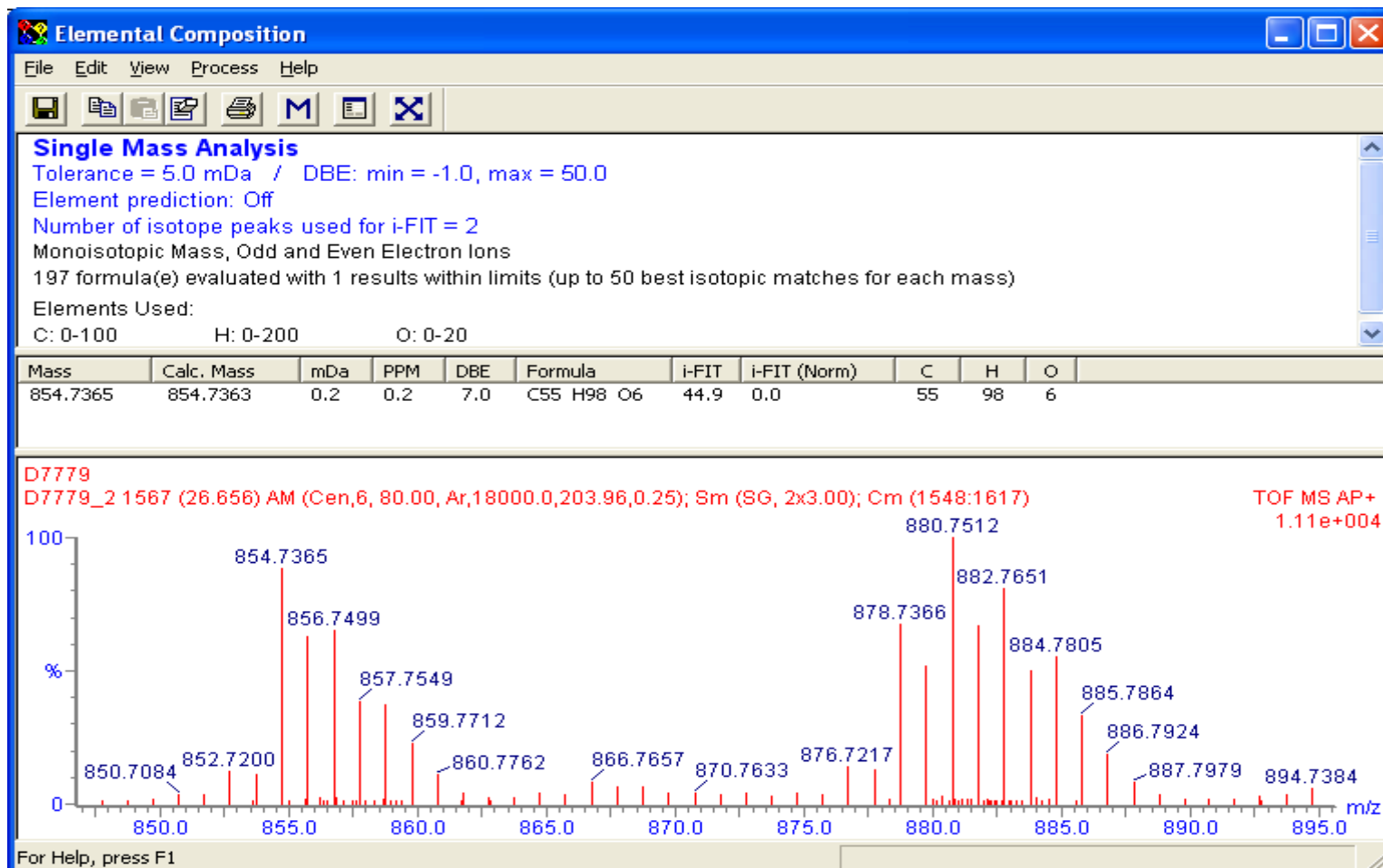


MW 854

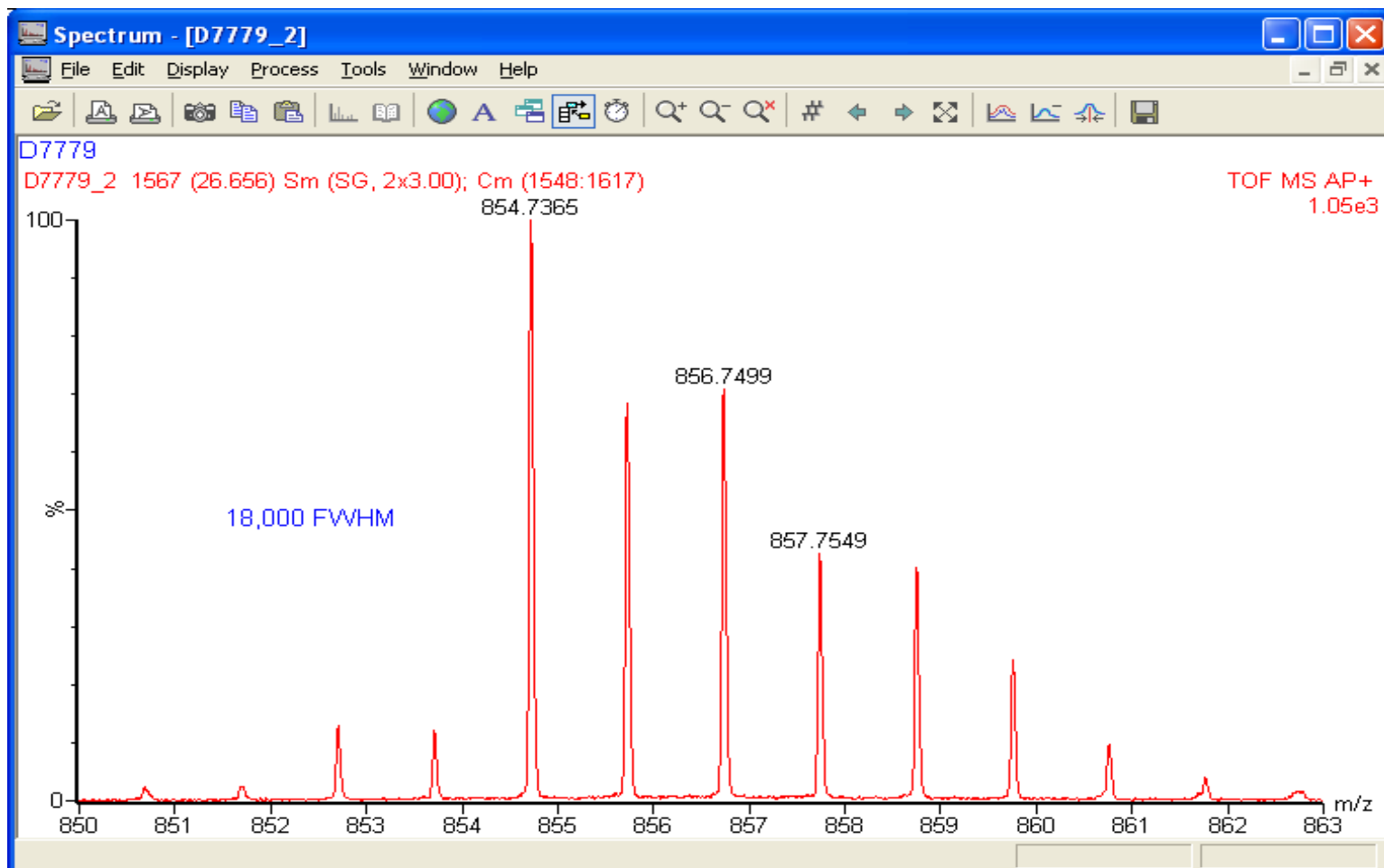
Triglycerides from a Tallow



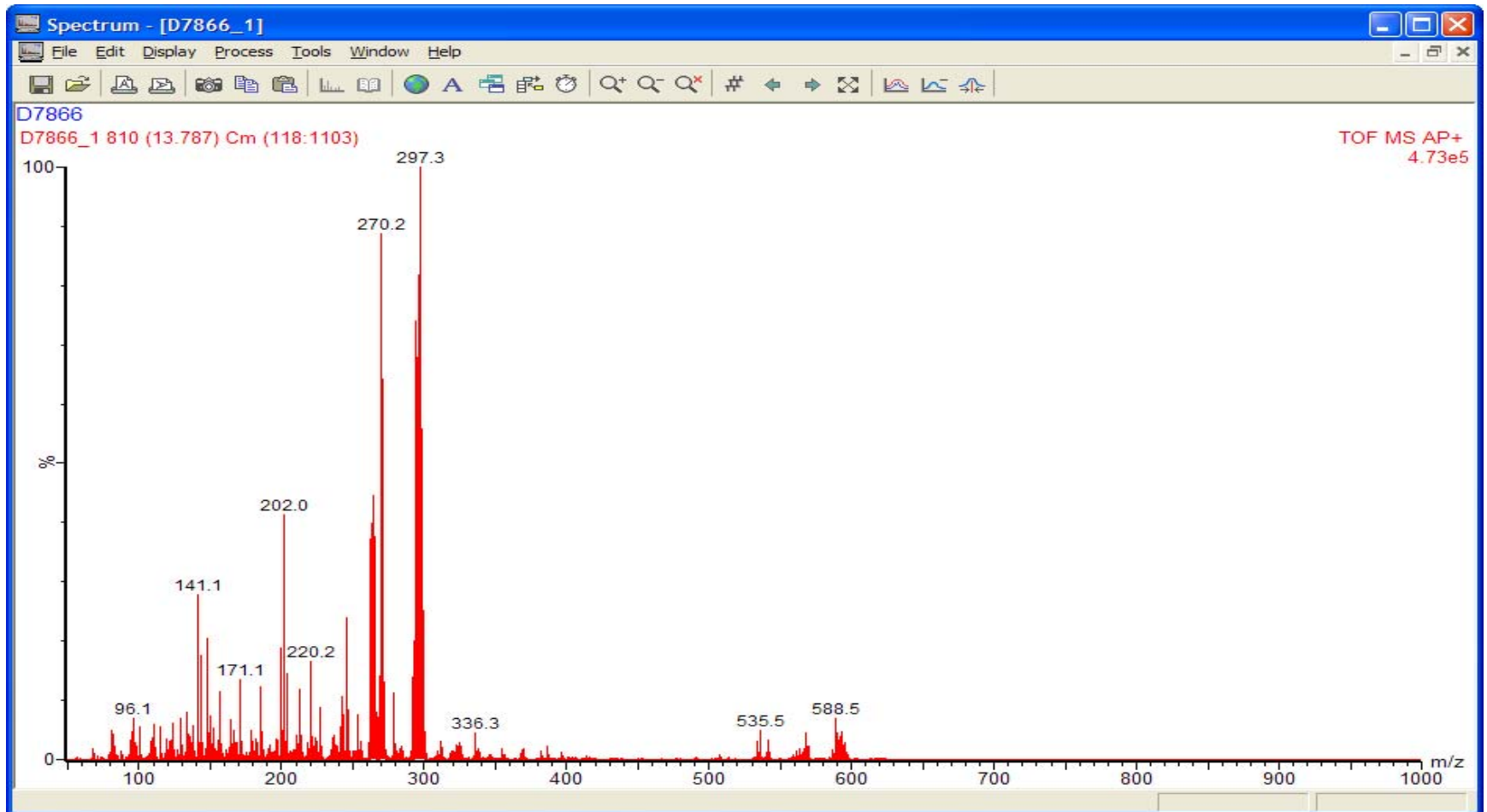
MW 880



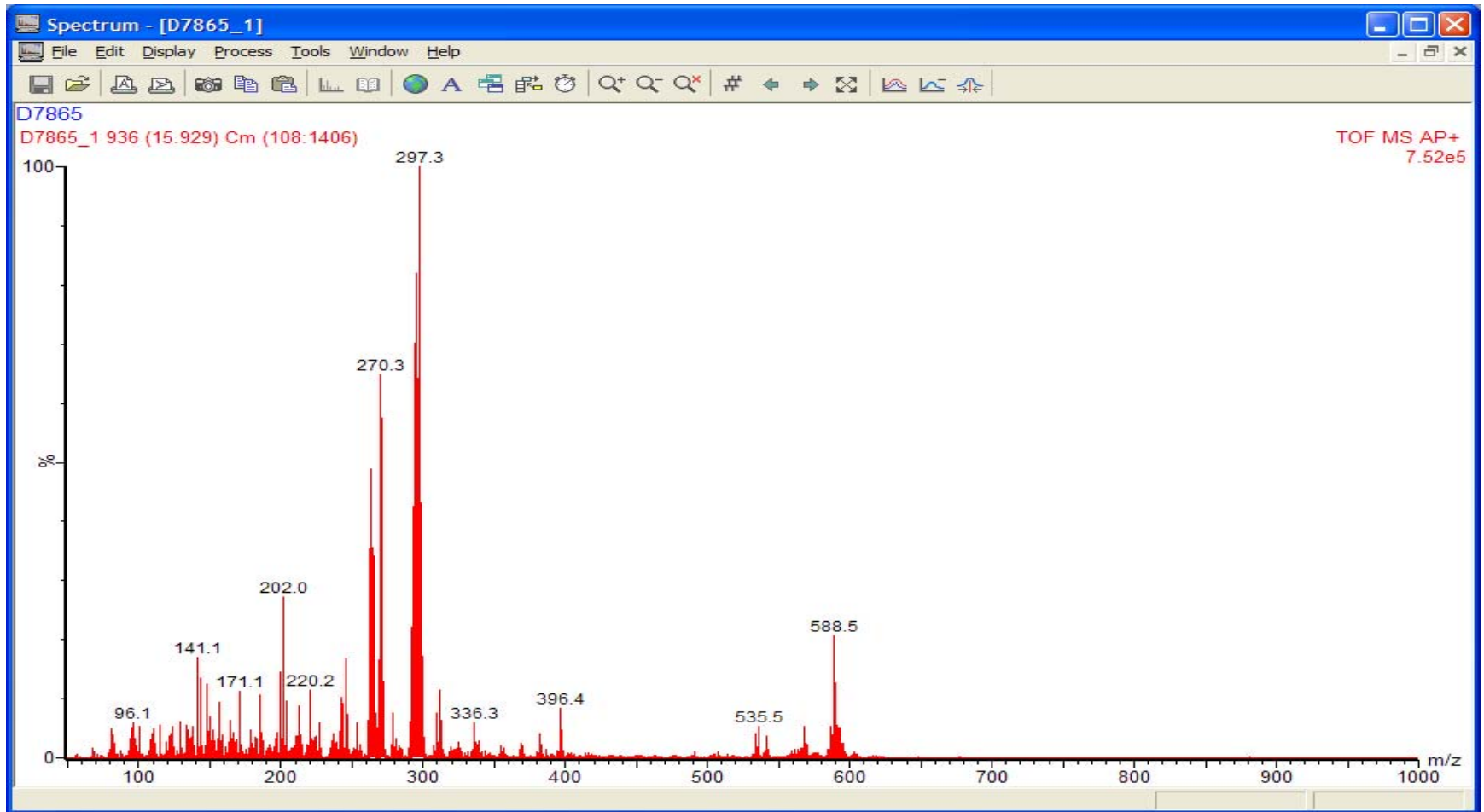
High Mass Resolution Example



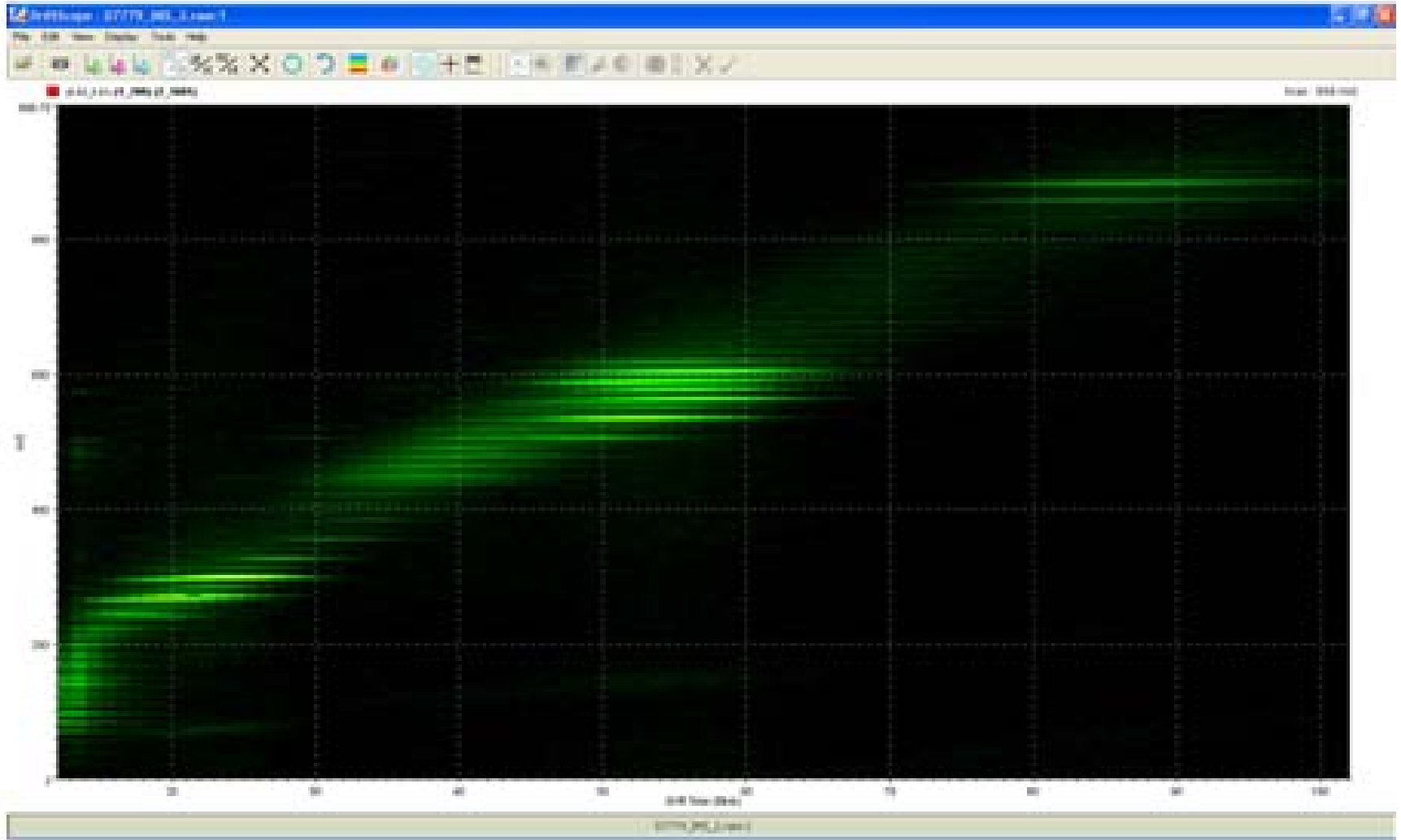
Tallow/Soy Full Mass Range



Used Cooking Oil



Tallow Biodiesel by ASAP on a SYNAPT with IMS



For future investigation

- Xevo/SYNAPT G2 source ASAP to allow 650C
- IMS on SYNAPT G2
- Automated ASAP temperature ramp to:
 - Improve reproducibility
 - Increase speed

MSMS to investigate structural features

Avoid dehydration reactions

Acknowledgements

- Chevron
- Jim Hudson, Cresente Dimagmaliw, Toni Miao, Chevron
- Steven Lai, Waters USA
- Hilary Major, Waters UK