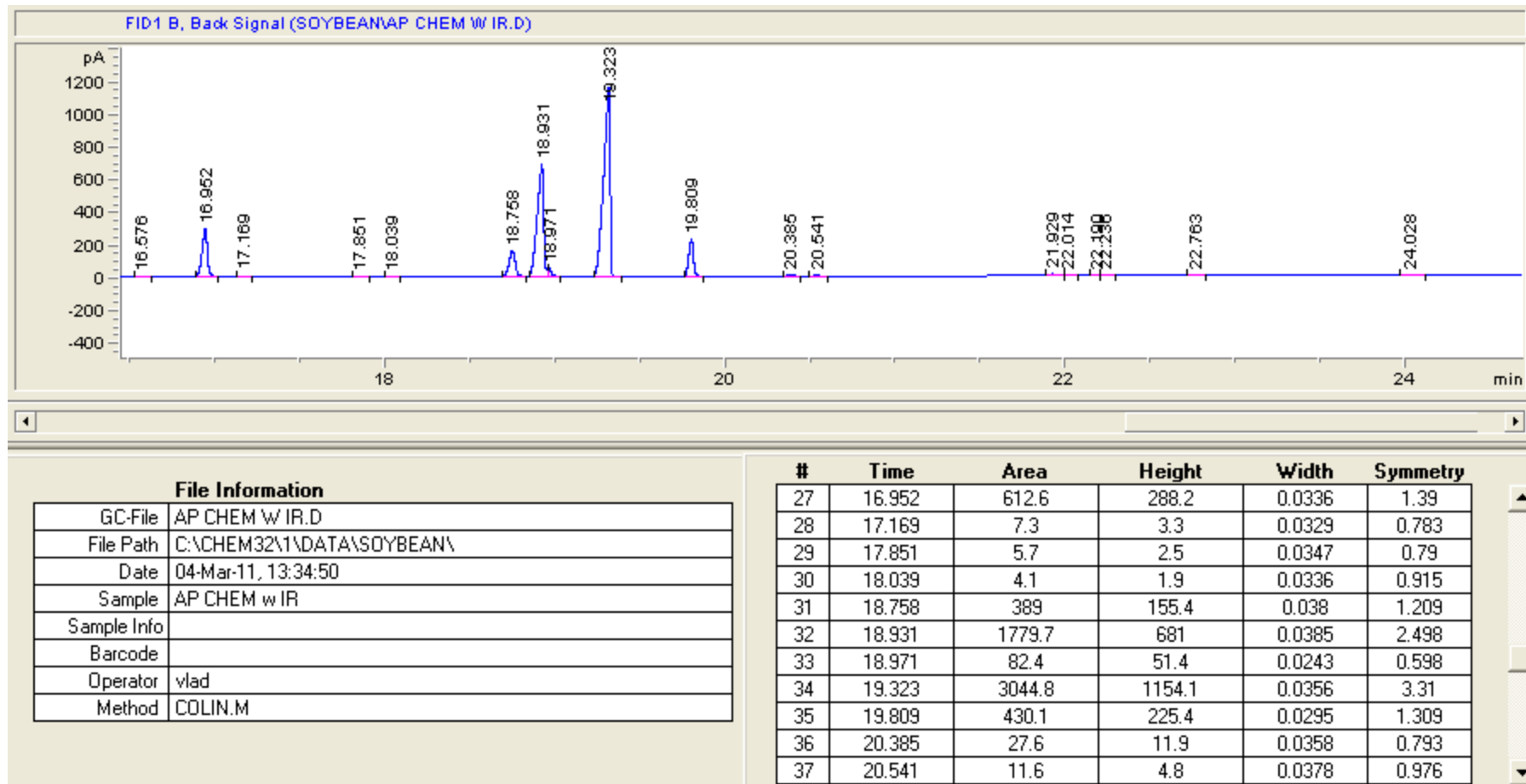


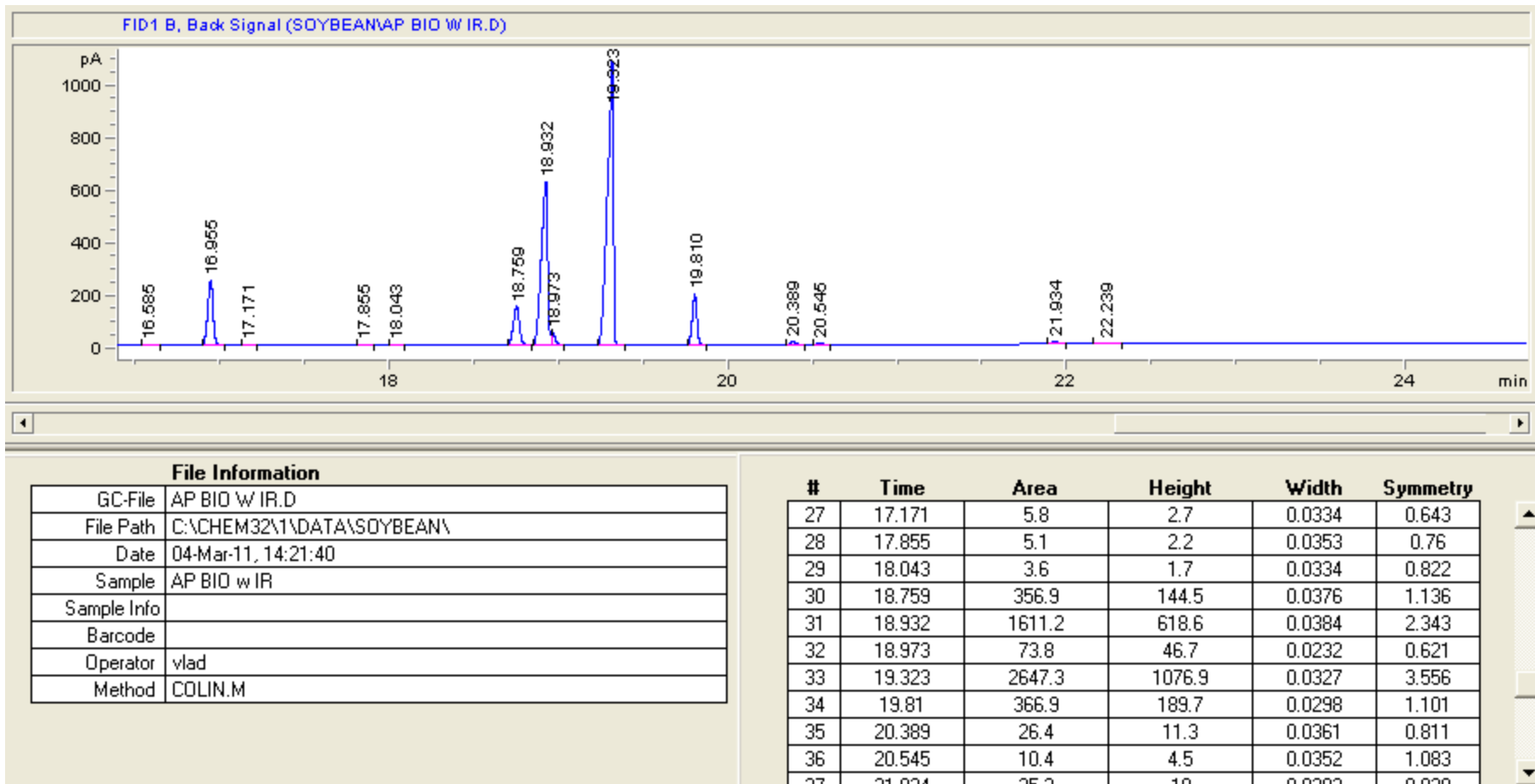


Biodiesel Analysis Results
for
Smyrna High School

AP CHEM Biodiesel gas chromatograph spectrum



AP BIO Biodiesel gas chromatograph spectrum



Composition analysis

Predicted Compound	Predicted Structure	AP BIO peak area	AP CHEM peak area
methyl myristate	C14:0	564.1744737	612.6
methyl palmitate	C16:0	380.1999049	389
methyl palmitoleate	C16:1	1716.385785	1779.7
	C:16:2	78.61796857	82.4
	C:16:3	2820.126669	3044.8
methyl heptadecanoate	C17:0	390.8527462	430.1
methyl 10-heptadecenoate	C17:1	28.12350095	27.6
methyl stearate	C18:0	11.07895492	11.6
methyl gamma linolenate	C18:3	26.95168841	29.8
methyl linolenate	C18:3	0	14.3
methyl arachidate	C20:0	0	17
methyl arachidonate	C20:4	0	15.9
methyl 11, 14, 17-eicosatrienoate	C20:3	0	25.8

- The peak areas above have been scaled to compensate for the effects of different injection sizes and sample concentration
- The peak area is directly related to the mass of material present
- The sample provided by the AP CHEM group has a larger variety of converted compounds than the AP BIO group
- The sample provided by the AP CHEM group also has a higher overall yield of Fatty Acid Methyl Esters (FAMES)

Methanol content

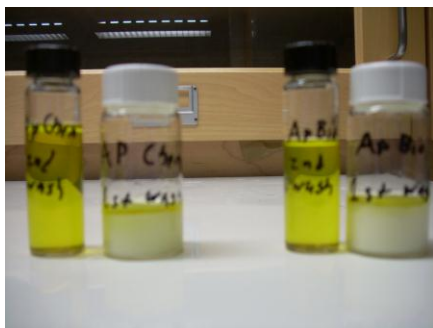
- The methanol content of the FAME and glycerol phase was determined by gas chromatography

Methanol concentration (wt%)		
	AP BIO	AP CHEM
FAMEs	4.43	4.72
Glycerol	11.26	11.46

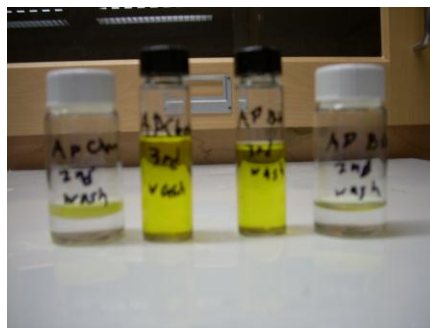
- The AP BIO sample contains less methanol in both phases
- The methanol remaining in both samples was removed by washing with water
- The number of washes required can be reduced by having a lower impurity (including methanol) concentration
- Conversion can be approximated using the above concentrations and the total mass of each phase collected

Washing process

- The samples were washed with a half their present volume of water
- 10 ml of each sample were washed
- After agitating the samples were centrifuged at 2500rpm for 5 minutes



Samples after 1st wash CHEM left, bio right



Samples after 2nd wash CHEM left, bio right



Samples after 3rd wash CHEM left, bio right

- The AP BIO sample only needed 2 washes and was easier to separate
- The AP CHEM sample required all 3 washes to get clear and was more difficult to separate
- However, the AP CHEM sample yielded a larger volume of clean biodiesel
- The difference in volume collected is due the amount of soap formed which is an undesired byproduct generated from excess catalyst

Conclusions

- The AP CHEM biodiesel sample contains a larger variety and quantity of FAMES than the AP BIO sample
- The AP BIO biodiesel sample had a lower concentration of methanol this made it easier to wash and able to be purified with fewer washes
- The AP CHEM biodiesel sample had a lower soap content and yielded a larger volume of biodiesel after washing