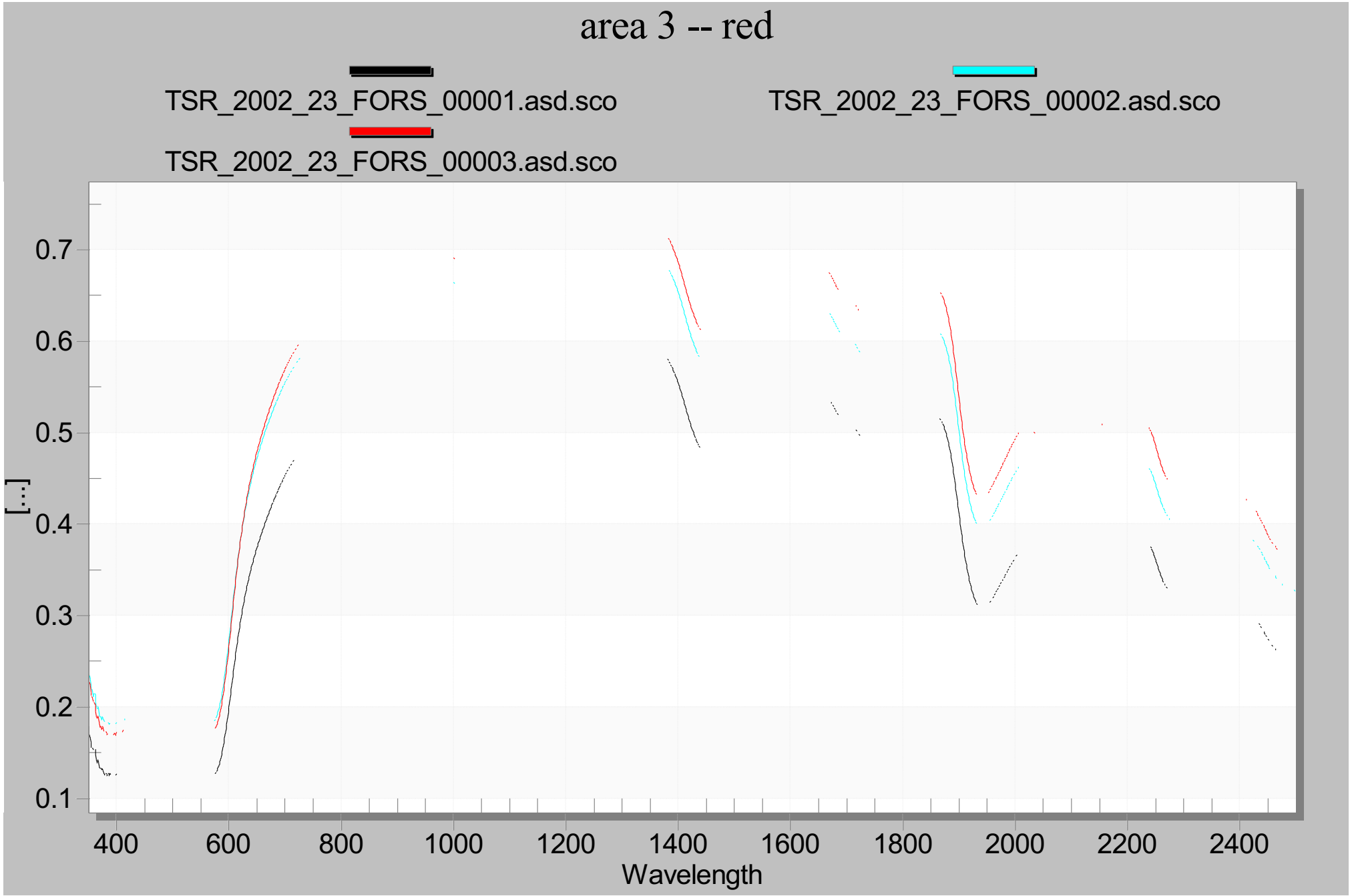
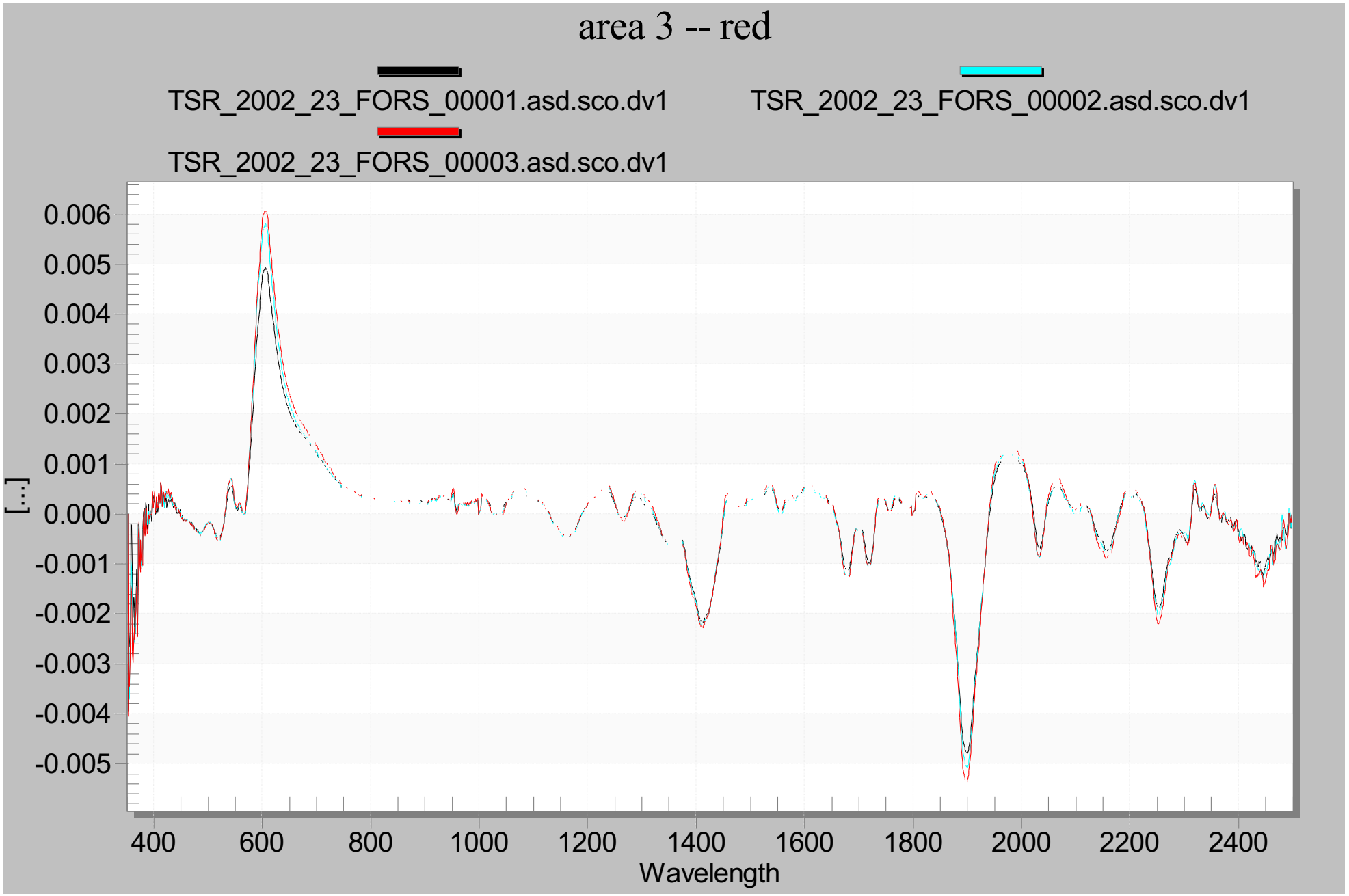
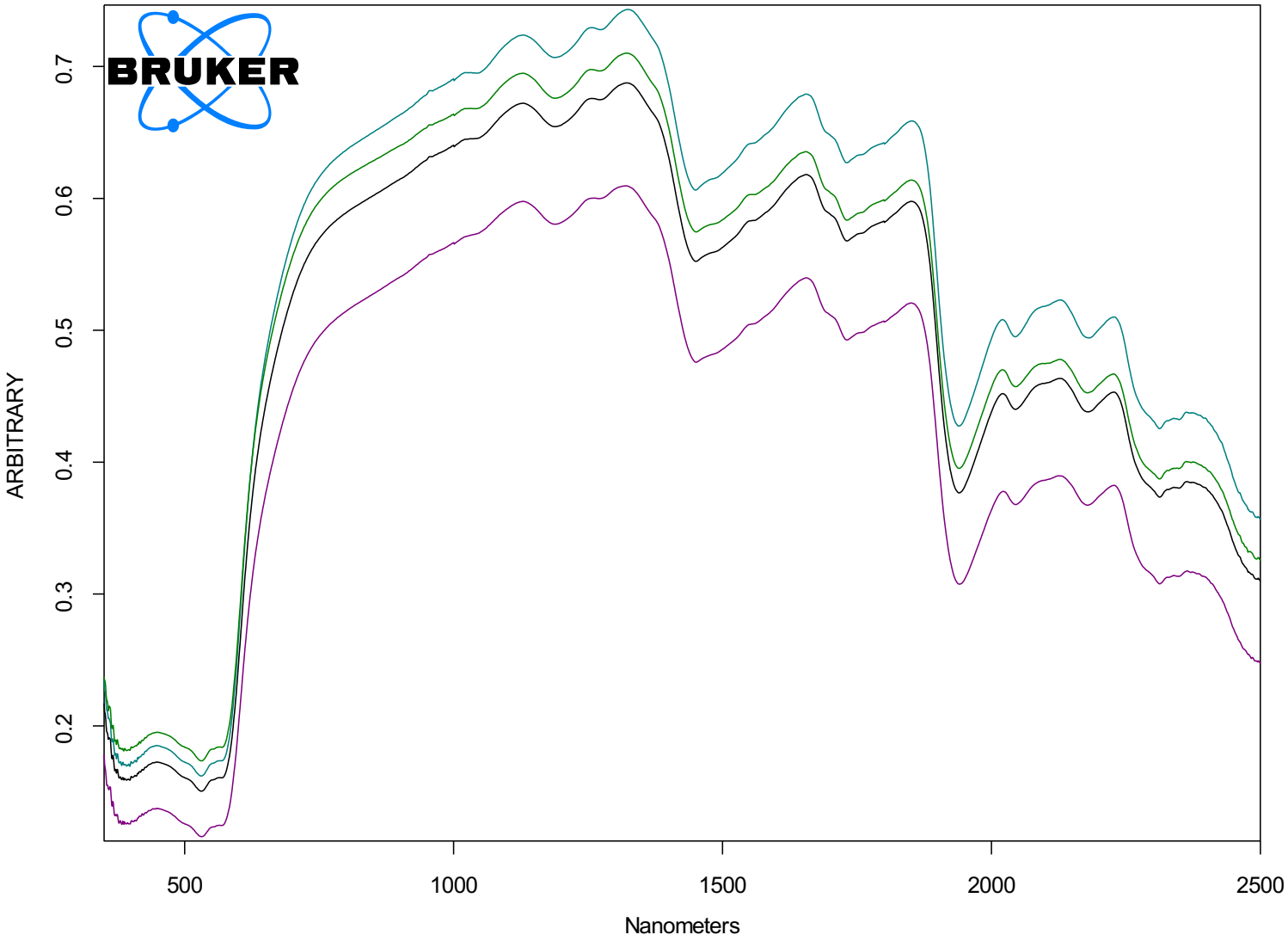
area 3 – red


area 3 -- red
TSR_2002_23_FORS_00001.asd.sco
TSR_2002_23_FORS_00002.asd.sco
TSR_2002_23_FORS_00003.asd.sco
0.7
0.6
0.5
0.4
0.3
0.2
0.1
[...]
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
Wavelength

area 3 – red


area 3 -- red
TSR_2002_23_FORS_00001.asd.sco.dv1
TSR_2002_23_FORS_00002.asd.sco.dv1
TSR_2002_23_FORS_00003.asd.sco.dv1
0.006
0.005
0.004
0.003
0.002
0.001
0.000
-0.001
-0.002
-0.003
-0.004
-0.005
[...]
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
Wavelength

area 3 – red



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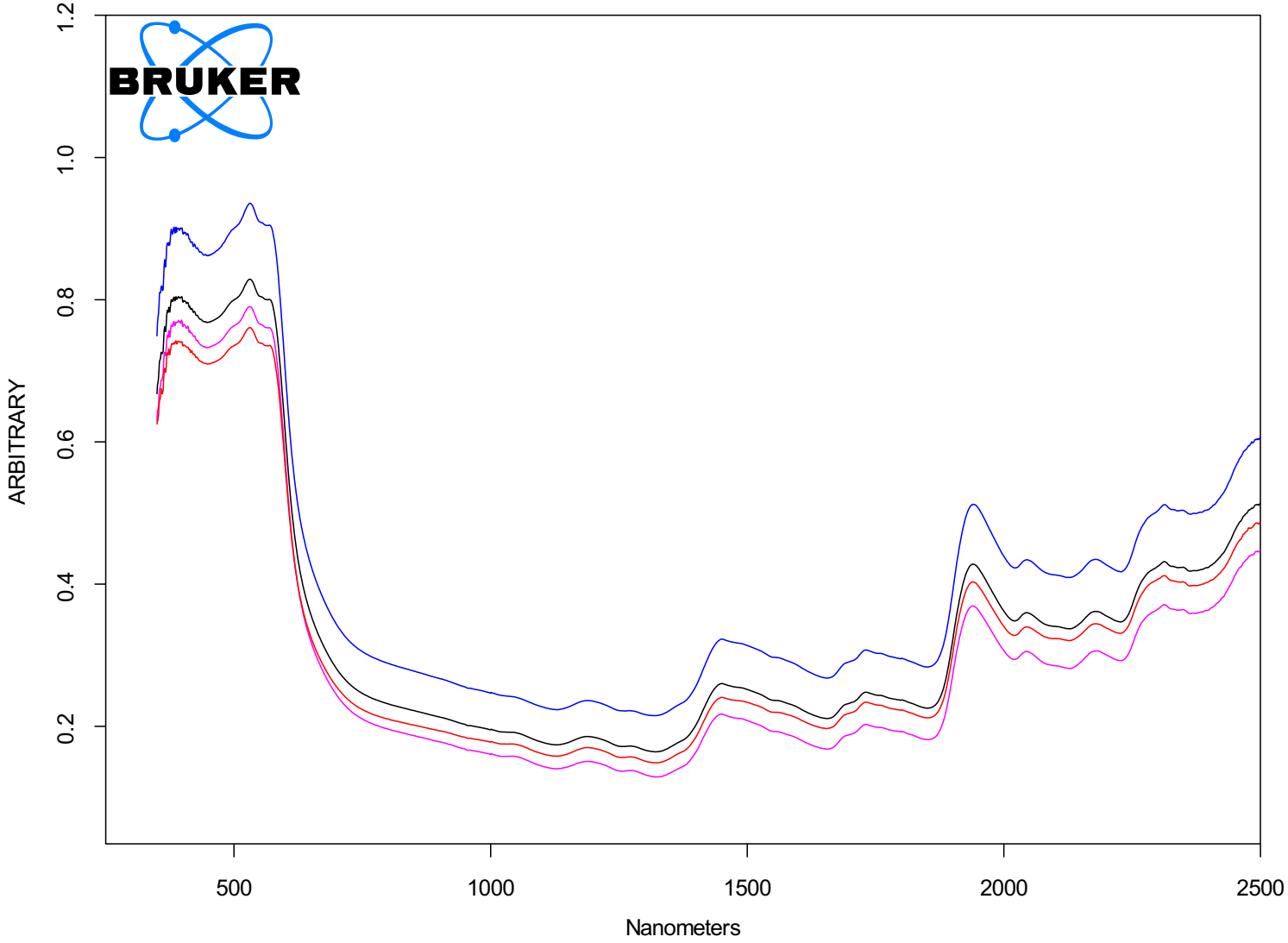
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area3REFL_av

average of 3 spectra

area 3 – red



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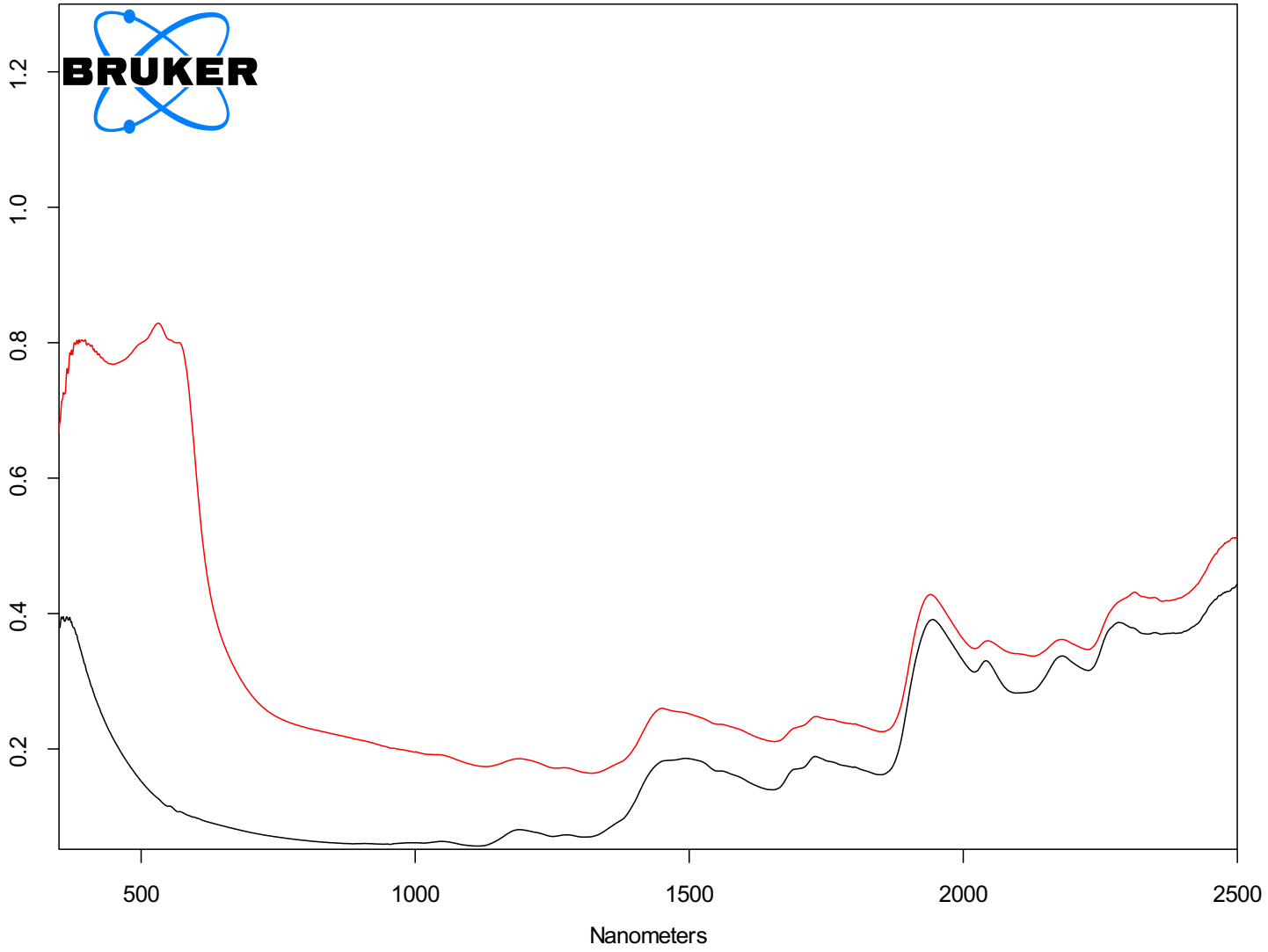
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\TSR_2002_23_FORS_00002.asd.sco.abs.dx	
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\TSR_2002_23_FORS_00003.asd.sco.abs.dx	
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area3_avg.0	

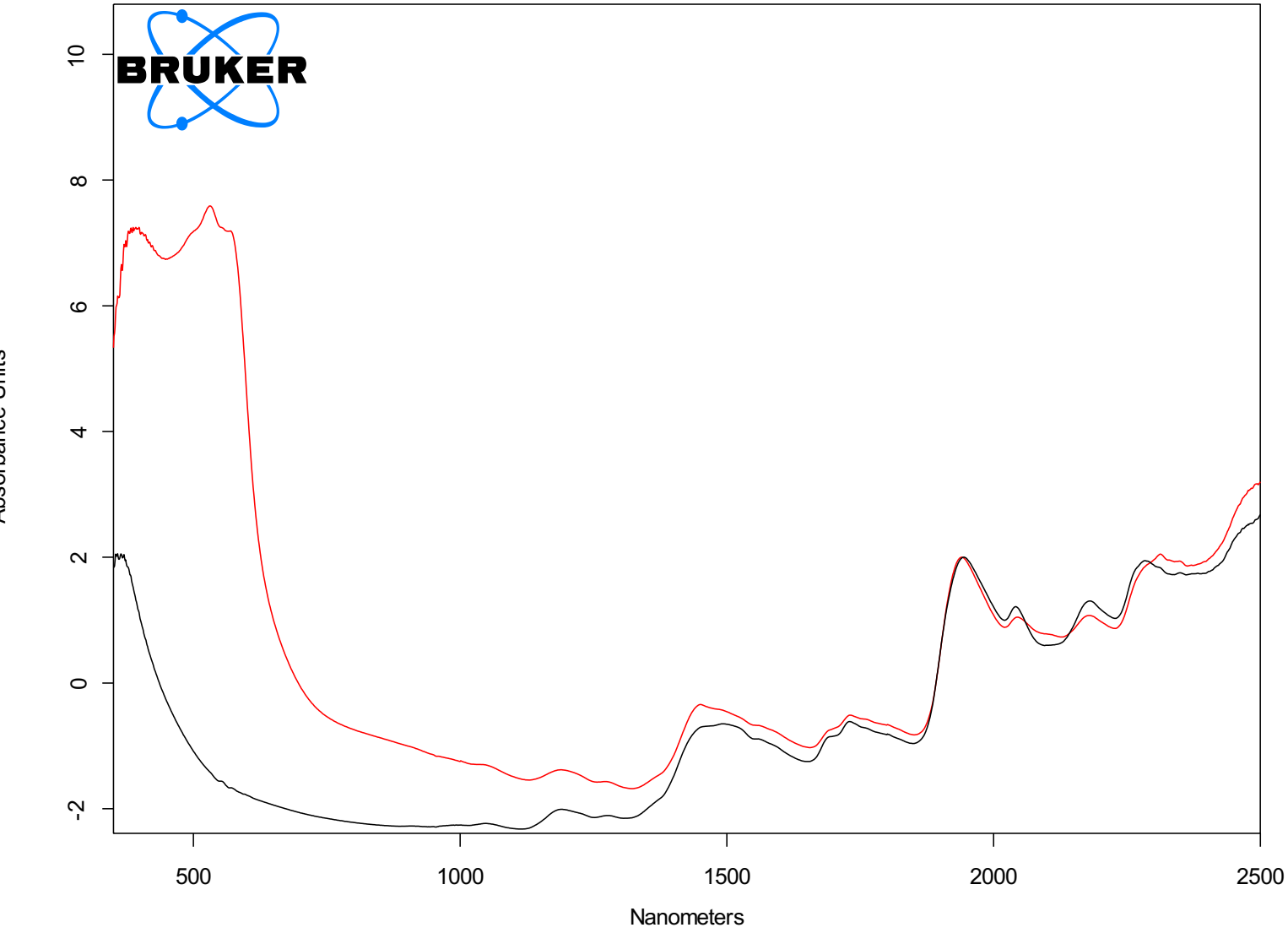
average of 3 spectra

area 3 – red



C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area3_avg.0	red
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area15_avg.0	parchment

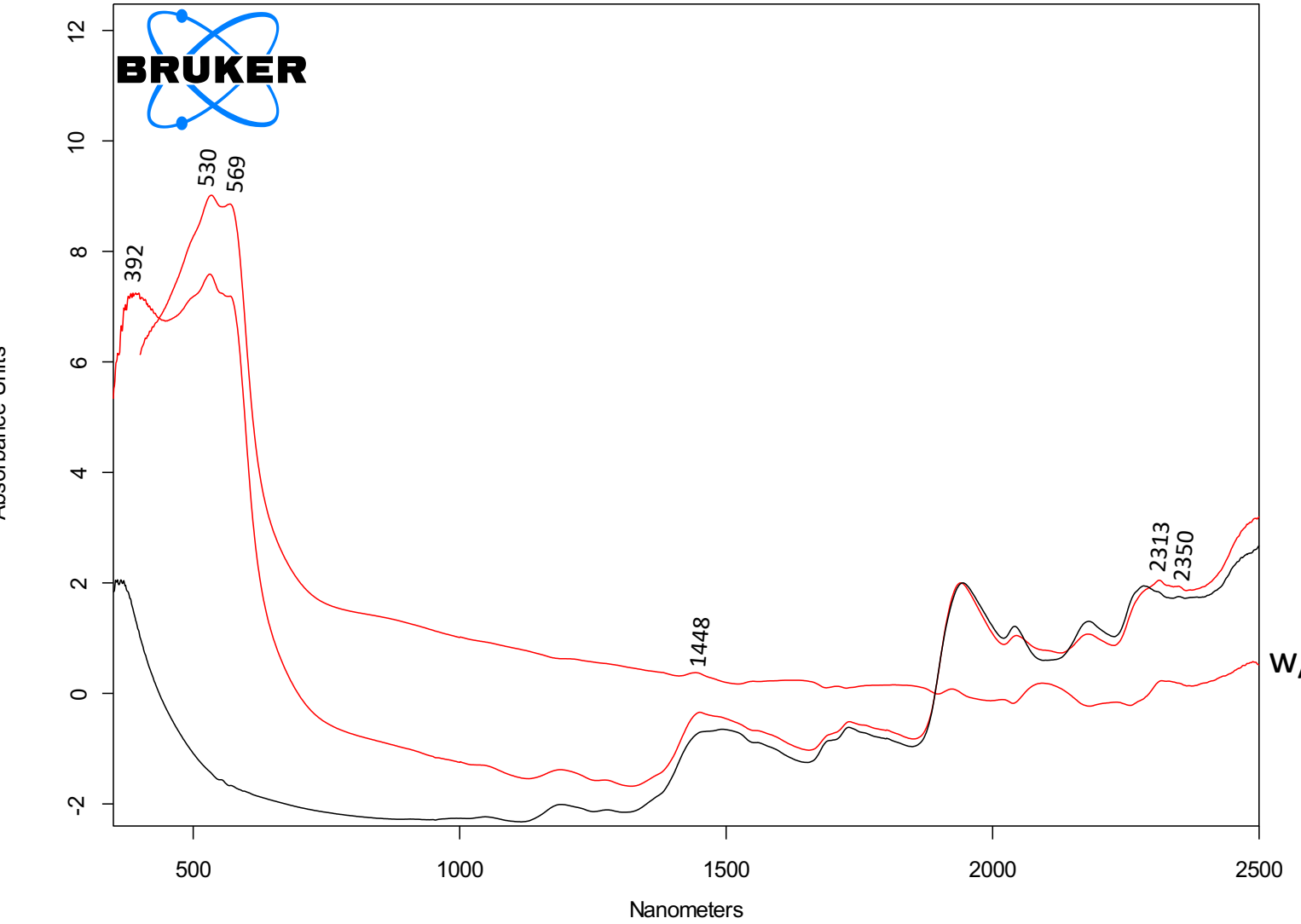
area 3 – red



normalized to the parchment band at 1940 nm

C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area15_avg.0	parchment
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area3_avg.0	red

area 3 – red



normalized to the parchment band at 1940 nm, plus variant w/ parchment subtracted

- possible lead white (weak 1448)
- insect-based red dye? (520 and 565 vs. 510 and 540 for plant-based); derivative at ~603nm
- trace egg yolk or wax??

w/ parchment subtracted

C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area15_avg.0	parchment
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area3_avg_SU	
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area3_avg.0	red

area 3 – red

OPUS/SEARCH **6/23/2016**

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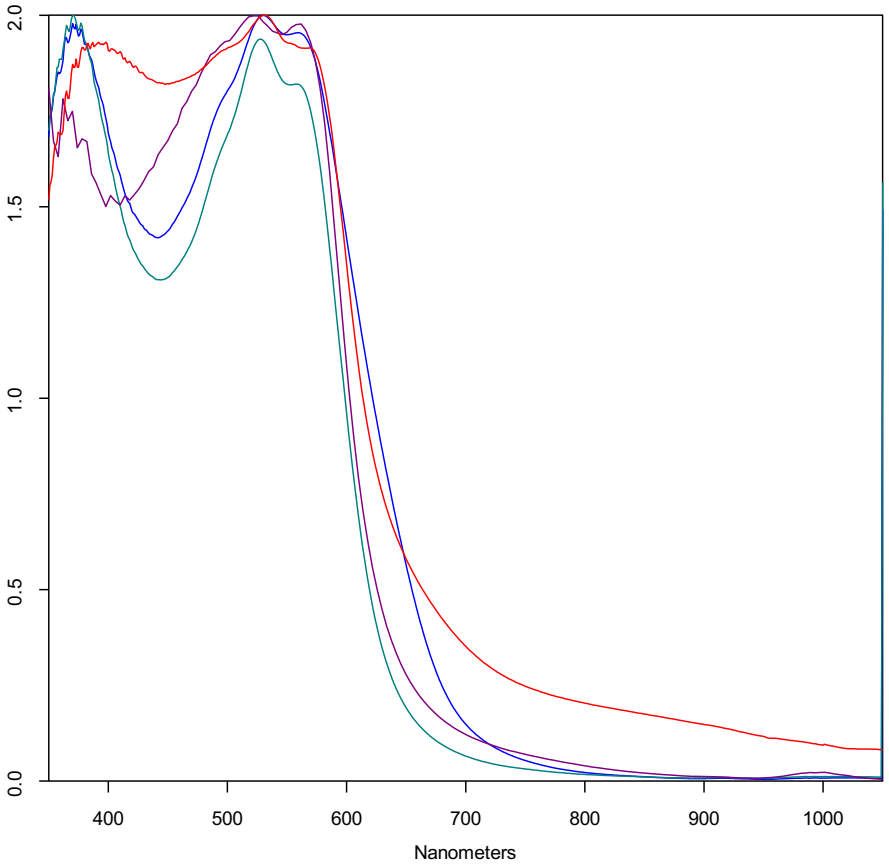

Compound information

Compound Name	Carmine
Molecular Formula	
Molecular Weight	
CAS Registry Number	
Binding Medium	Egg White
Instrument	ASD Instrument

Carmine

cochineal + chalk

cochineal, lake

Hit No.	Hit Quality	Compound Name	Entry No.	Lib. Index	Molecular formula	Molecular weight	CAS number
1	720	madder lake	3	1			
2	715	Carmine	24	2			
3	704	Carmine	45	2			
4	683	vermilion	1	1			
5	682	alizarine crimson	32	1			

search on Lgrefl spectrum (350-1050) turns up mostly insect-based dyes

area 3 – red

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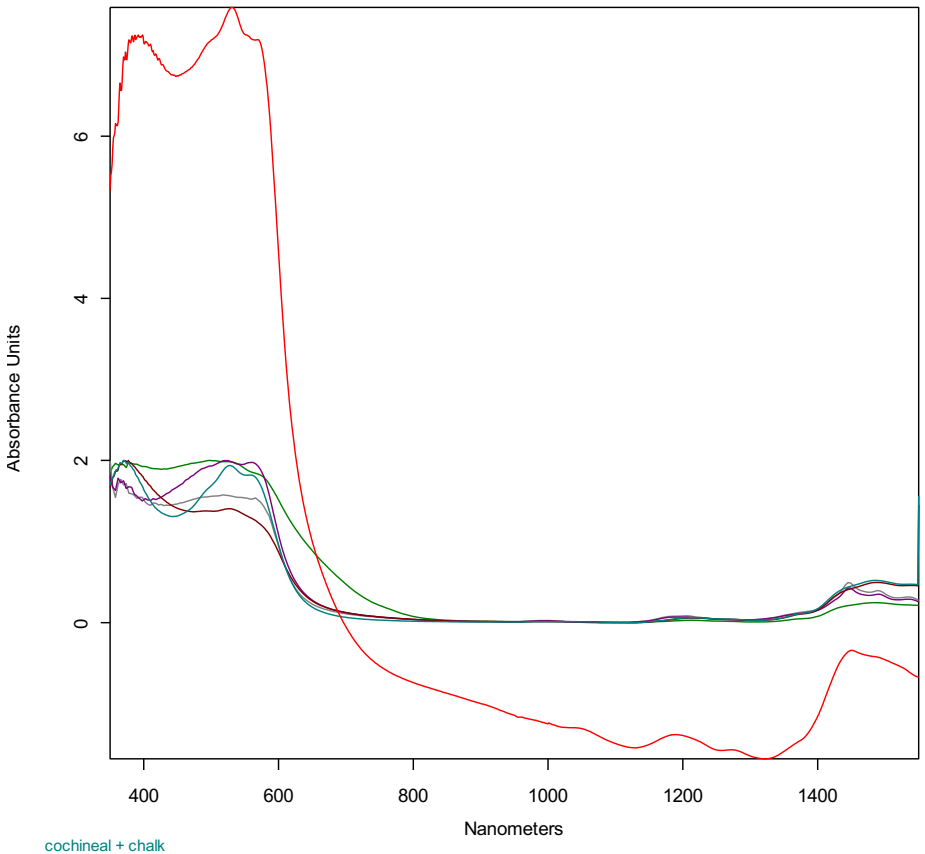

cochineal + chalk
kermes
Carmine
Carmine
Lac Dye

Compound information	
Compound Name	Lac Dye
Molecular Formula	
Molecular Weight	
CAS Registry Number	
Binding Medium	Glair
Support	Paper
Instrument	ASD Instrument
Light	bifurcated cable

Hit No.	Hit Quality	Compound Name	Entry No.	Lib. Index	Molecular formula	Molecular weight	CAS number
1	719	madder lake	3	1			
2	715	Carmine	24	2			
3	704	Carmine	45	2			
4	683	vermilion	1	1			
5	680	alizarine crimson	32	1			

search on ABS spectrum seems basically the same, though direct comparison is more difficult

area 3 – red

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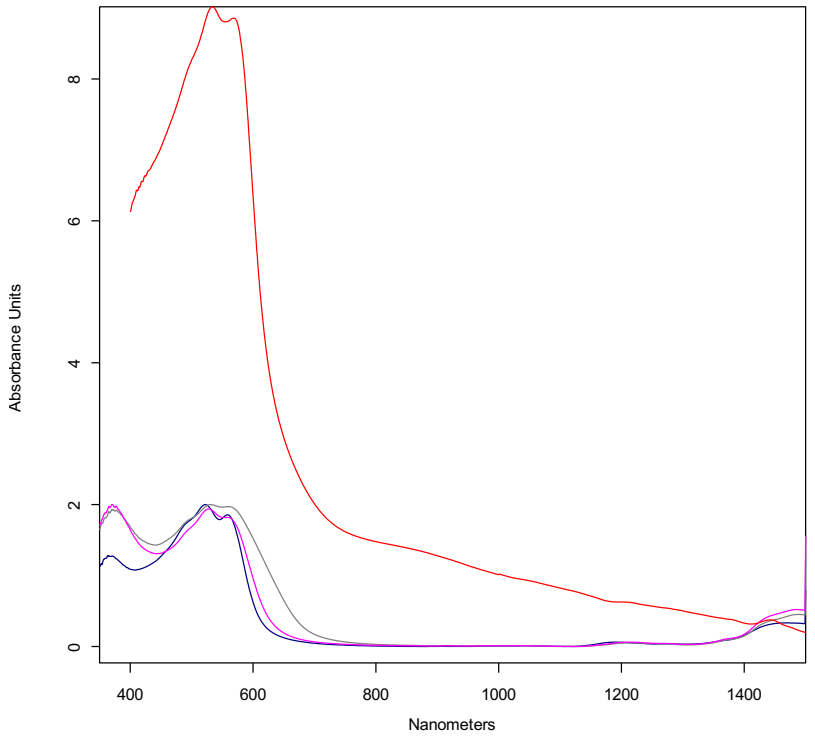


Compound information

Compound Name	cochineal + chalk
Molecular Formula	
Molecular Weight	
CAS Registry Number	
Binding Medium	gum
Support	paper
Instrument	ASD
other	NTorgcolorants_00024.asd.sco

cochineal + chalk

cochineal, lake

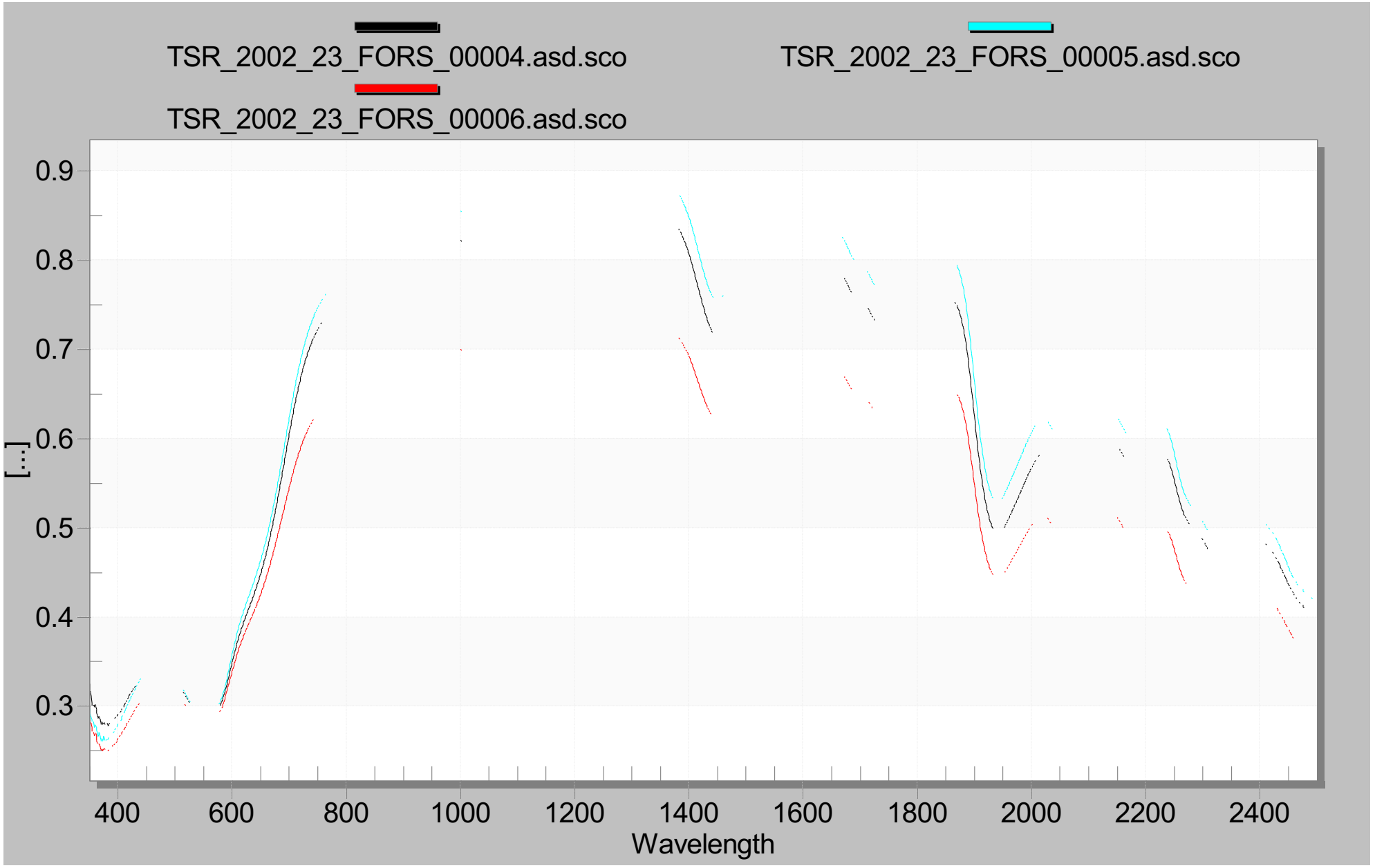
red beet

Hit No.	Hit Quality	Compound Name	Entry No.	Lib. Index	Molecular formula	Molecular weight	CAS number
1	787	alizarine crimson	32	1			
2	738	madder lake	3	1			
3	662	cochineal + chalk	24	4			
4	649	vermilion	1	1			
5	642	lac dye	40	1			

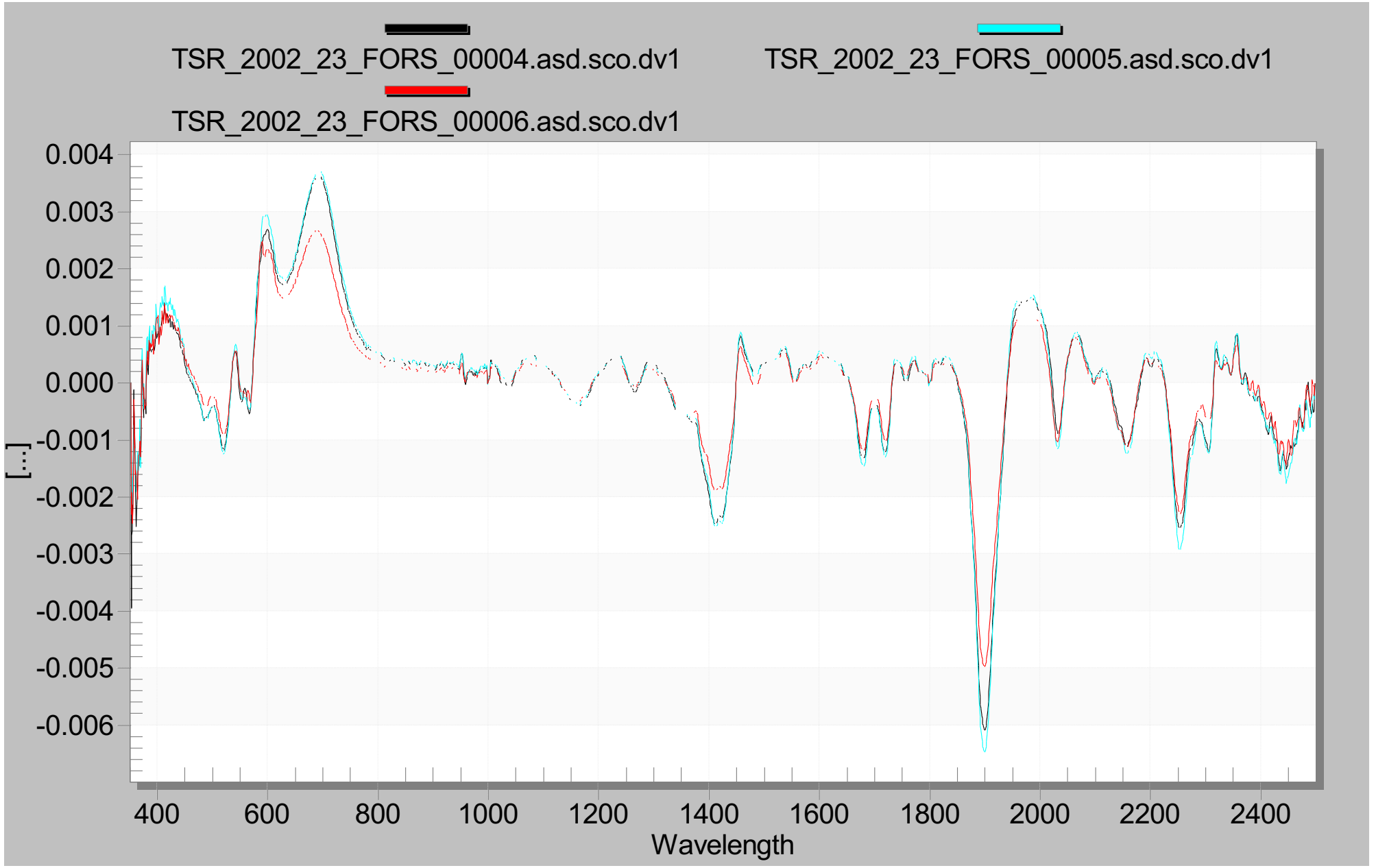
search on ABS subtracted spectrum seems basically the same

in all cases, the top hit was a plant-based dye, but MORE of the hits are insect-based.

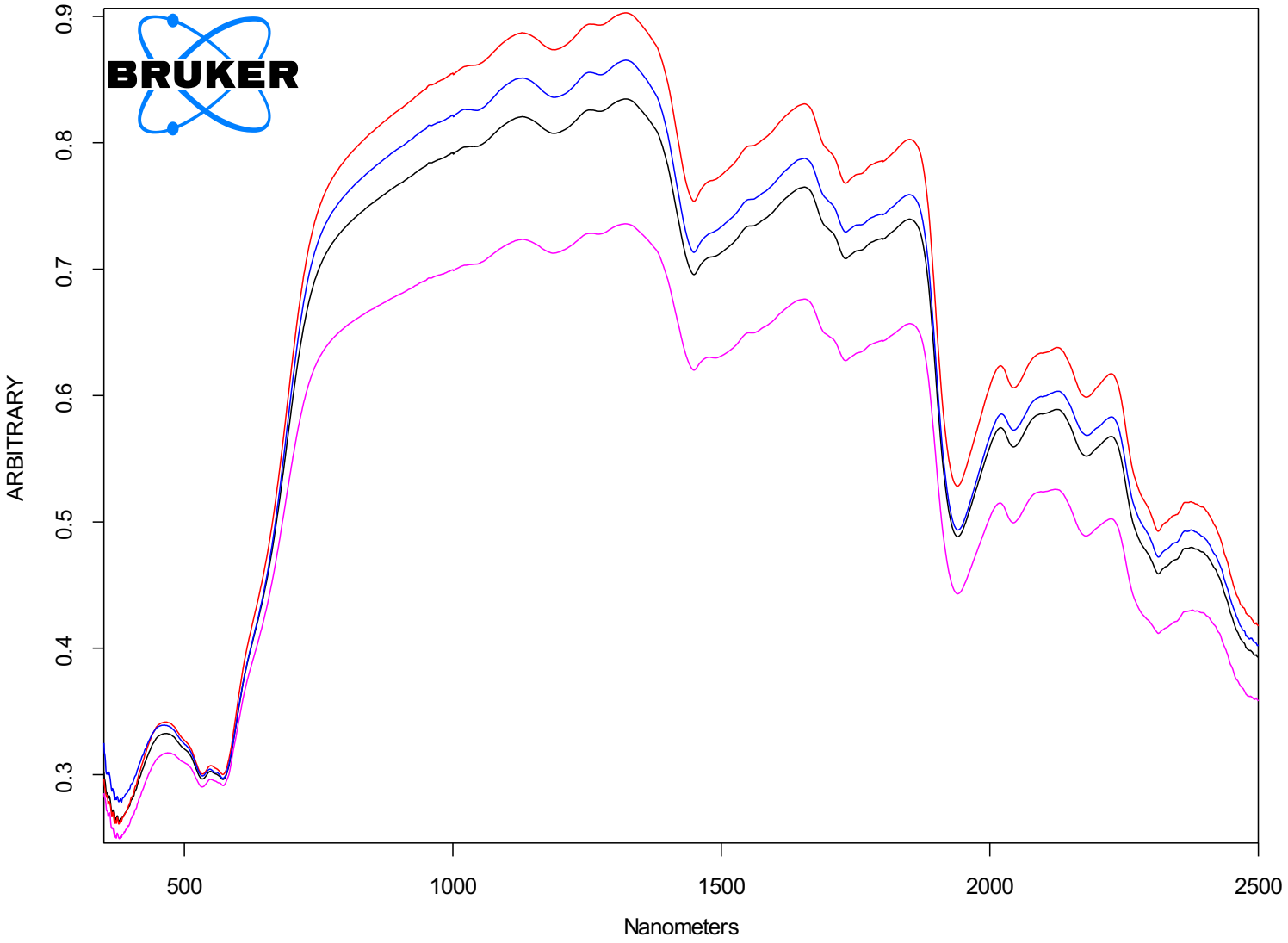
area 13 – purple



area 13 – purple



area 13 – purple



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C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\TSR_2002_23_FORS_00005.asd.sco.dx
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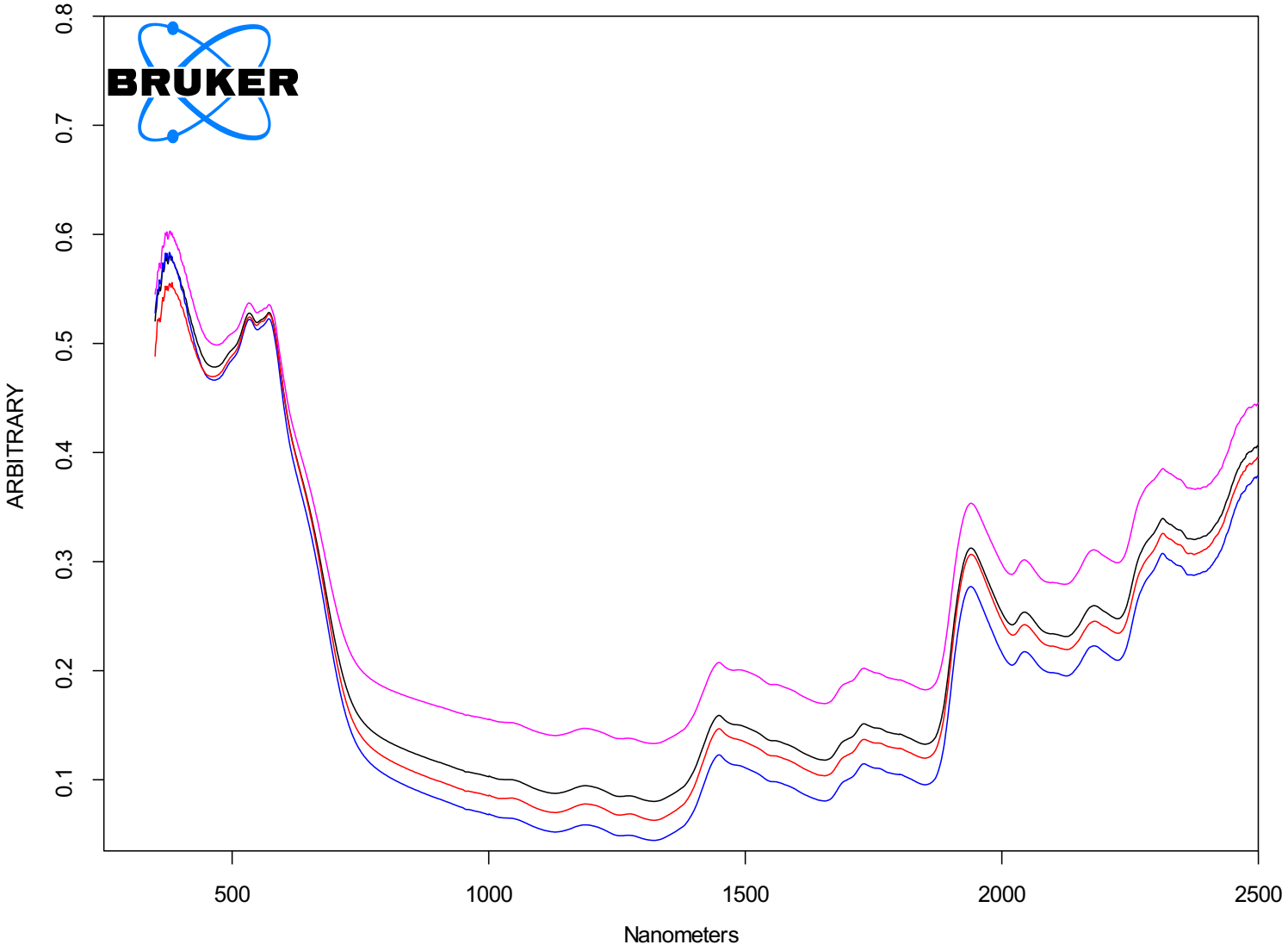
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area13REFL_a

average of 3 spectra

area 13 – purple



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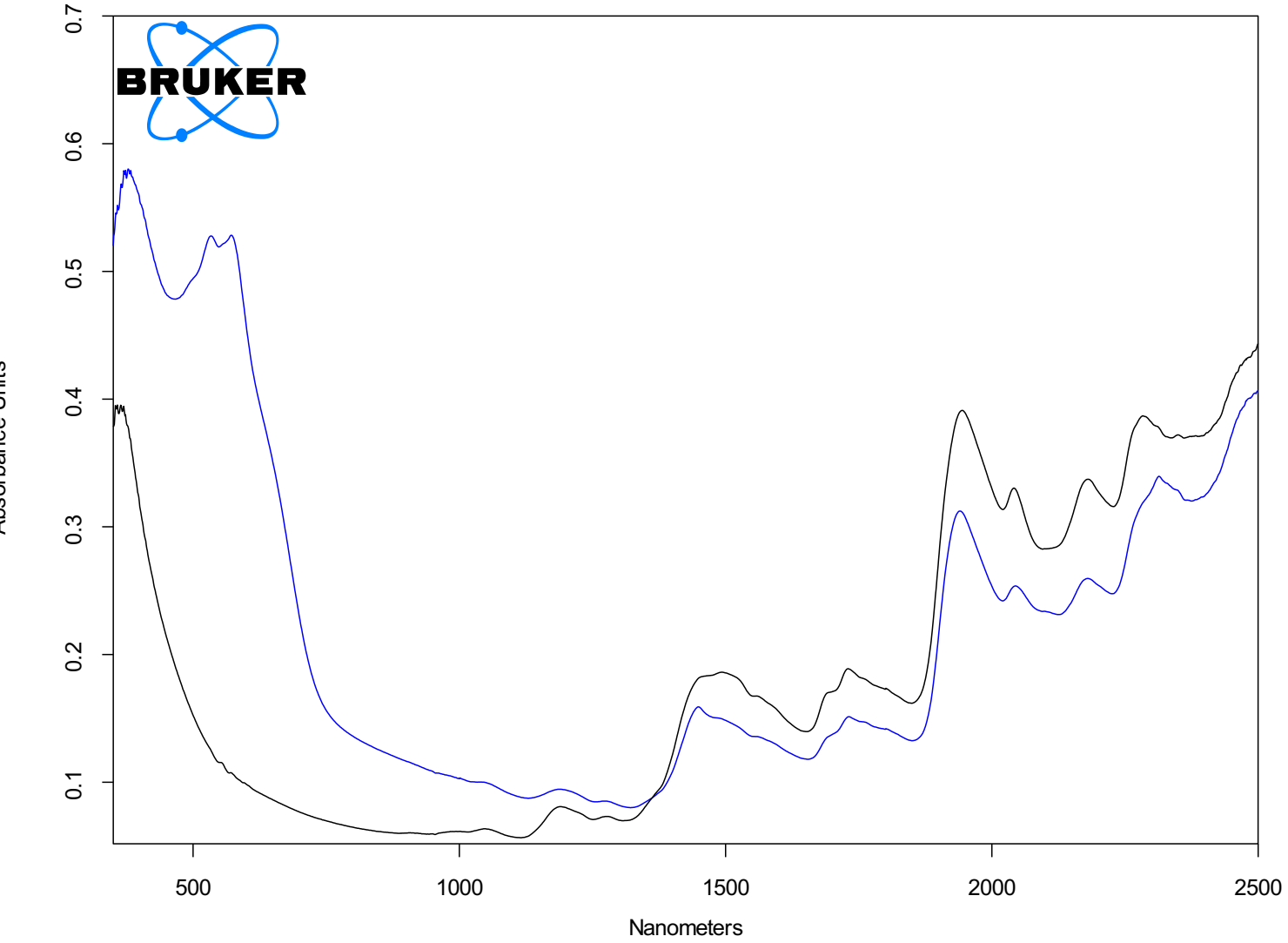
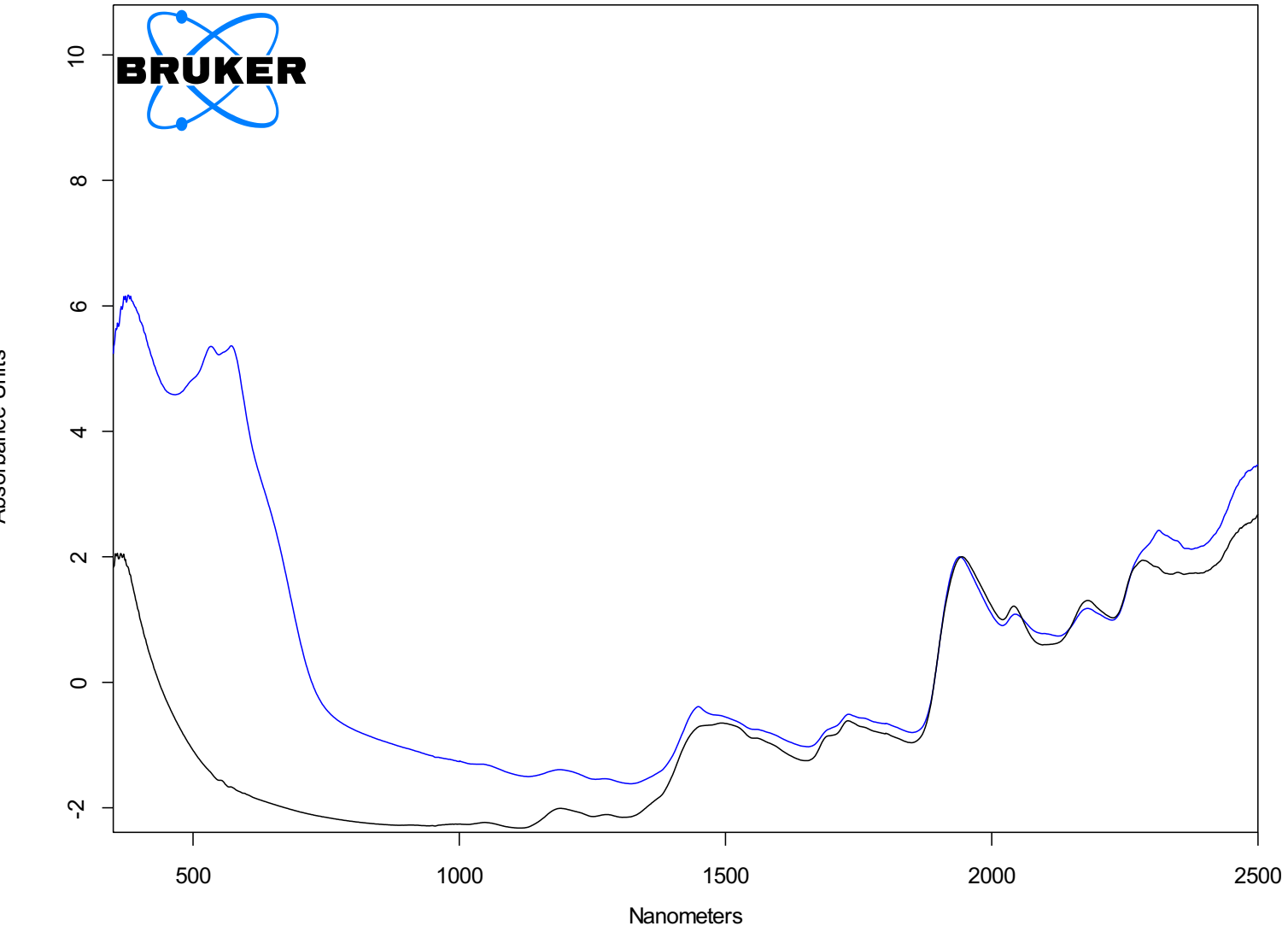
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\TSR_2002_23_FORS_00005.asd.sco.abs.dx	
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\TSR_2002_23_FORS_00006.asd.sco.abs.dx	
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area13_avg.0	average of 3 spectra

area 13 – purple



C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area15_avg.0	parchment
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area13_avg.0	purple

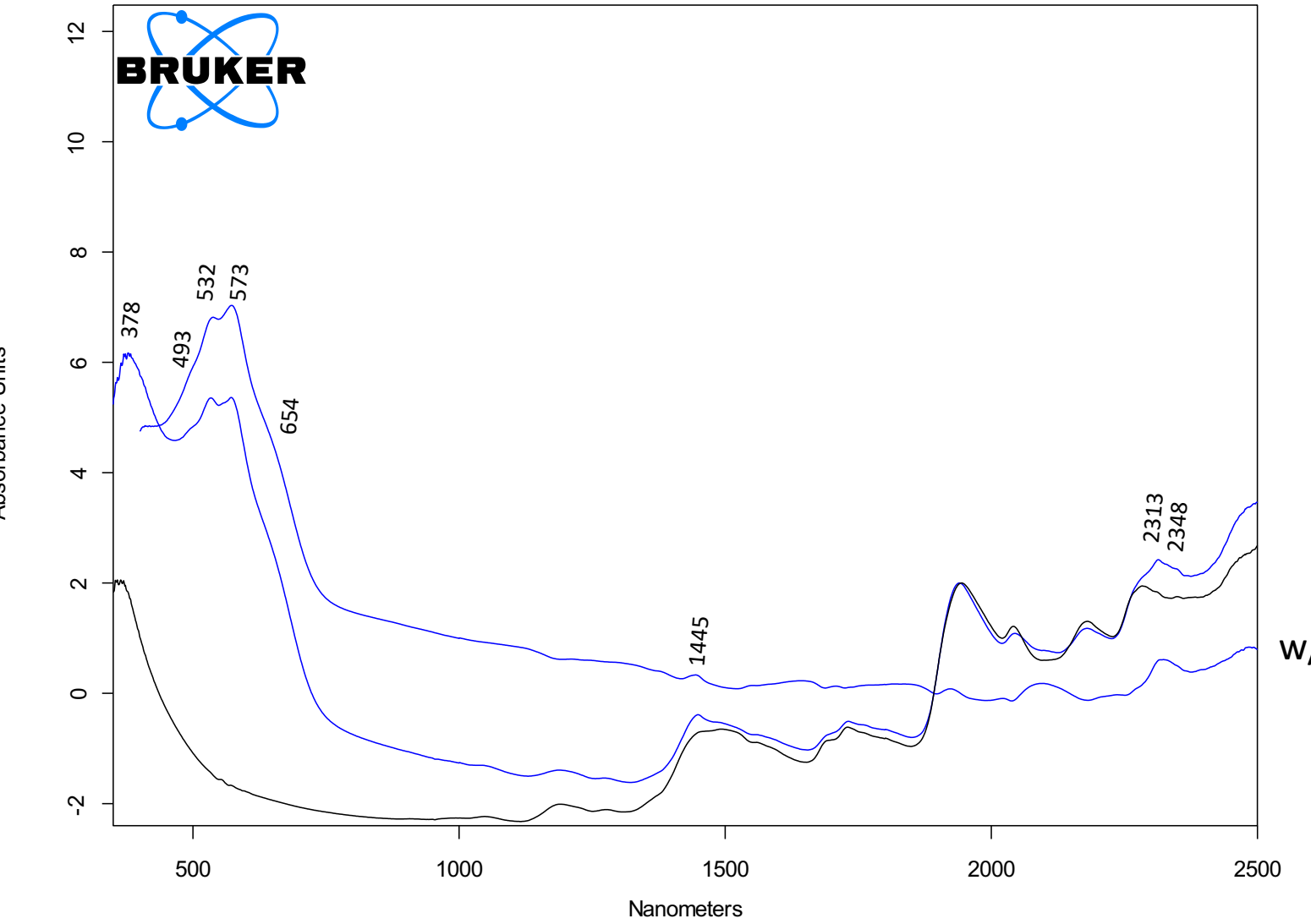
area 13 – purple



normalized to the parchment band at 1940 nm

C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area15_avg.0	parchment
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area13_avg.0	purple

area 13 – purple



normalized to the parchment band at 1940 nm, plus variant w/ parchment subtracted

- possible lead white (weak 1445)
- insect-based red dye – maybe lac dye? (520 and 565 vs. 510 and 540 for plant-based); double derivative at ~595 and 691 nm – the 595 der. might be the red dye
- ultramarine/lapis as blue mixer – 691 nm derivative peak
- trace egg yolk or wax??

w/ parchment subtracted

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C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area13_avg.0	
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area13_avg_S	purple

area 13 – purple

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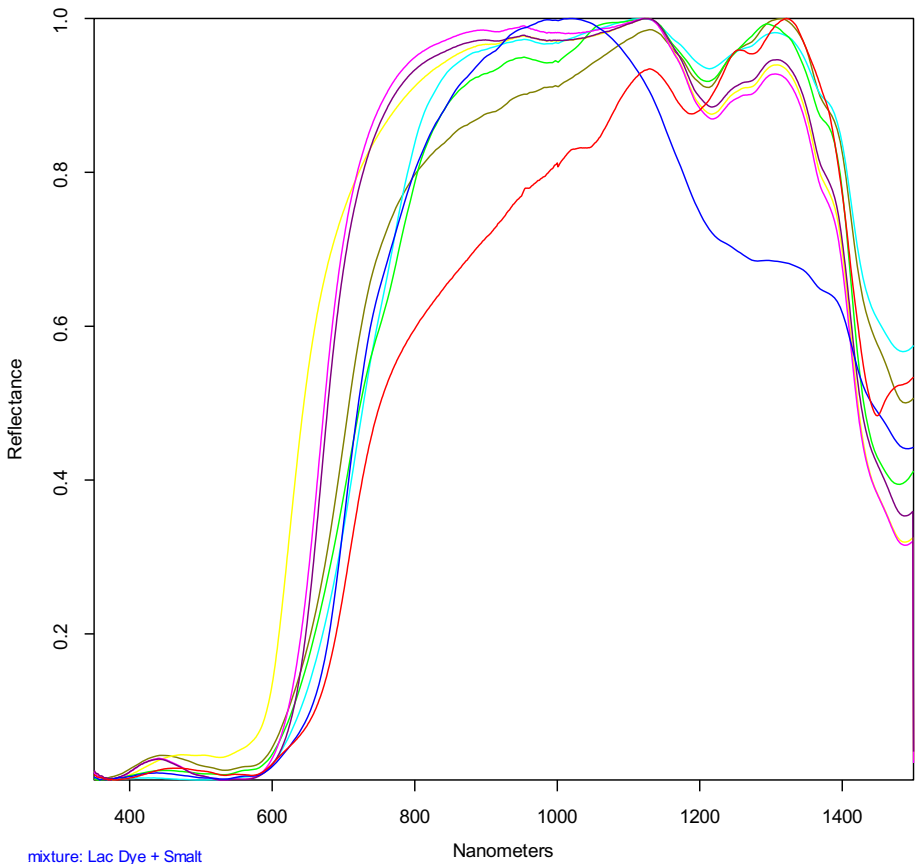

Compound information	
Compound Name	mixture: Lac Dye + Lapis
Molecular Formula	
Molecular Weight	
CAS Registry Number	
Binding Medium	Egg Yolk
Support	Paper
Instrument	ASD Instrument
Light	bifurcated cable

Hit No.	Hit Quality	Compound Name	Entry No.	Lib. Index	Molecular formula	Molecular weight	CAS number
1	691	mixture: Lac Dye + Smalt	170	2			
2	631	cochineal, lake	26	4			
3	628	cochineal, lake	25	4			
4	614	Lac Dye	55	2			
5	580	Lac Dye	57	2			

search on refl spectrum, 350-1050 nm;
mostly insect bases, but not great matches

area 13 – purple

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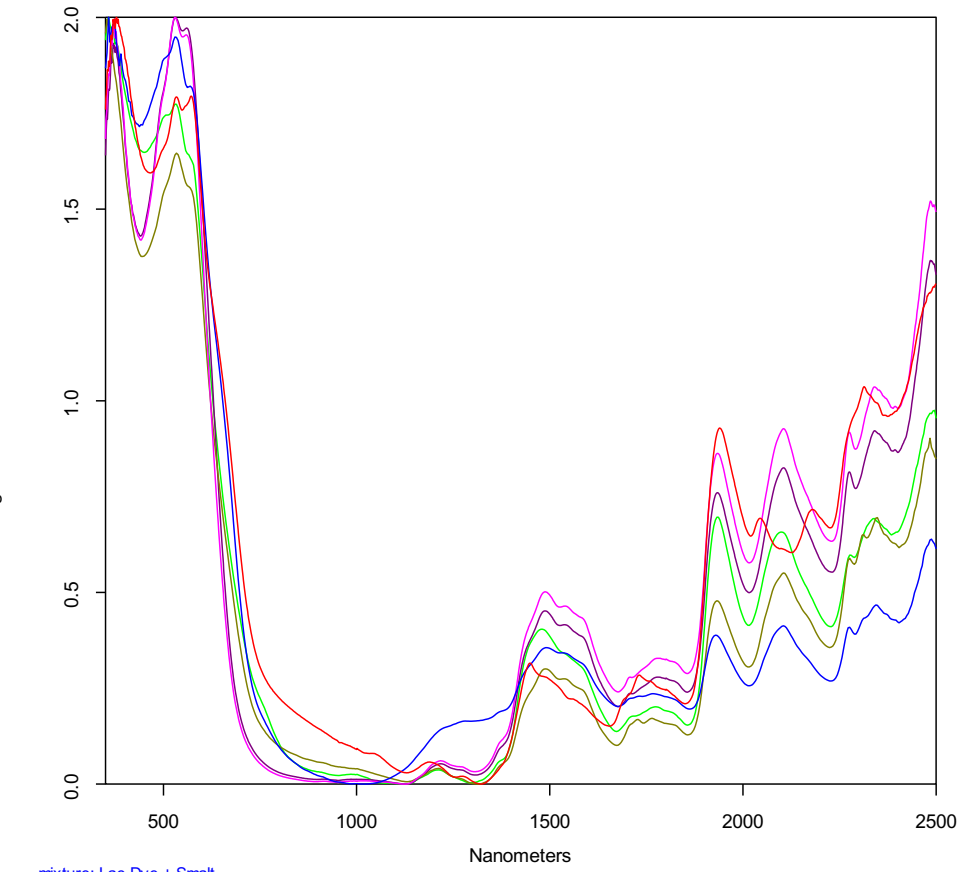

Compound information

Compound Name	Lac Dye
Molecular Formula	
Molecular Weight	
CAS Registry Number	
Binding Medium	Gum
Support	Paper
Instrument	ASD Instrument
Light	bifurcated light

Hit No.	Hit Quality	Compound Name	Entry No.	Lib. Index	Molecular formula	Molecular weight	CAS number
1	691	mixture: Lac Dye + Smalt	170	2			
2	631	cochineal, lake	26	4			
3	628	cochineal, lake	25	4			
4	614	Lac Dye	55	2			
5	580	Lac Dye	57	2			

search on refl spectrum, 350-1050 nm; mostly insect bases, lac dye actually looks like a pretty good match. Lac + blue??

PUS/SEARCH

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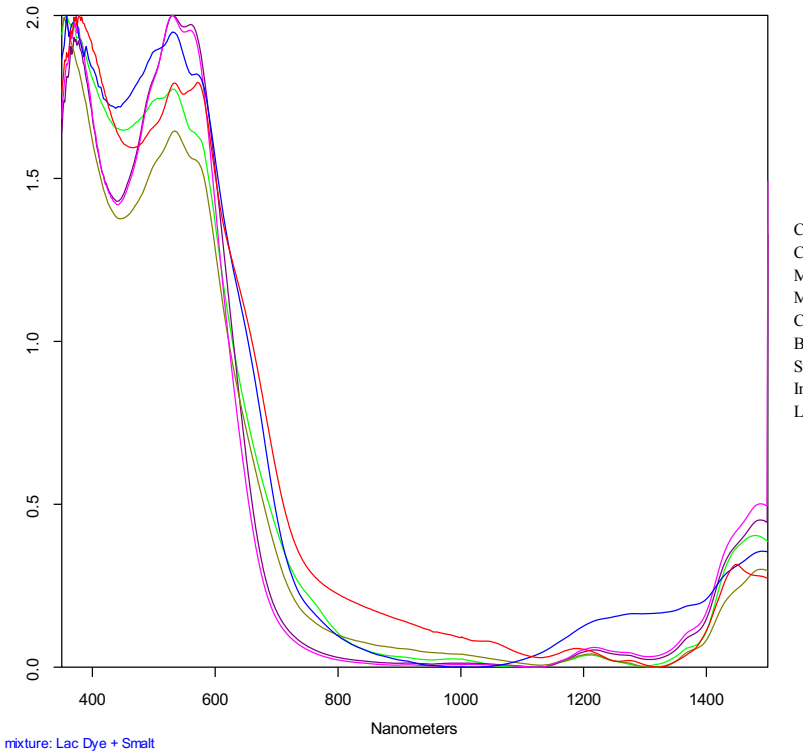

area 13 – purple

OPUS/SEARCH **6/23/2016**

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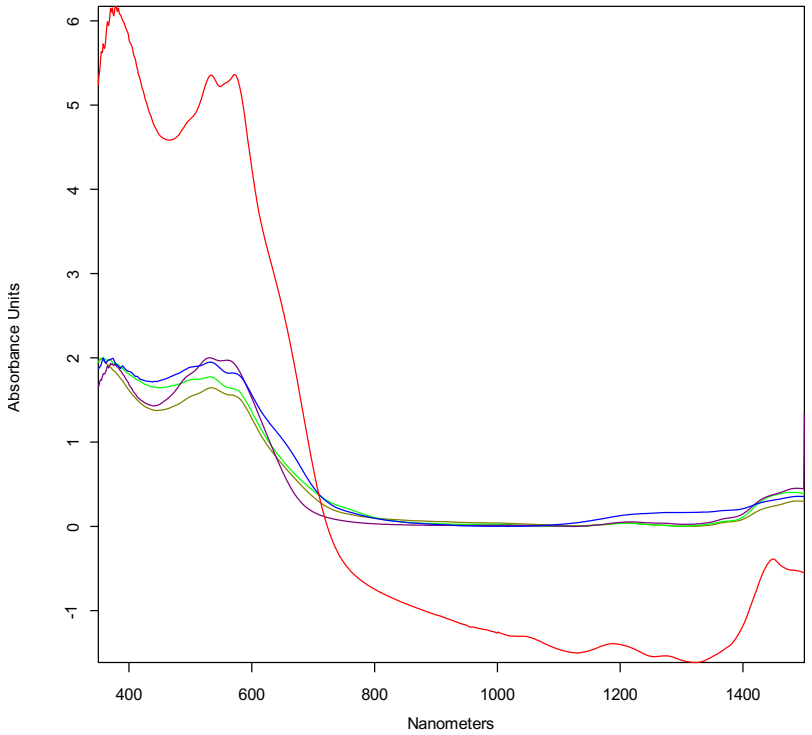

Compound information

Compound Name	mixture: Lac Dye + Lapis
Molecular Formula	
Molecular Weight	
CAS Registry Number	
Binding Medium	Egg Yolk
Support	Paper
Instrument	ASD Instrument
Light	bifurcated cable

mixture: Lac Dye + Smalt

cochineal, lake

Lac Dye

mixture: Lac Dye + Lapis

Hit No.	Hit Quality	Compound Name	Entry No.	Lib. Index	Molecular formula	Molecular weight	CAS number
1	690	mixture: Lac Dye + Smalt	170	2			
2	632	cochineal, lake	26	4			
3	629	cochineal, lake	25	4			
4	614	Lac Dye	55	2			
5	580	Lac Dye	57	2			

search on ABS spectrum, 350-1050 nm; mostly insect bases, lac dye actually looks like a pretty good match. Lac + blue??

area 13 – purple

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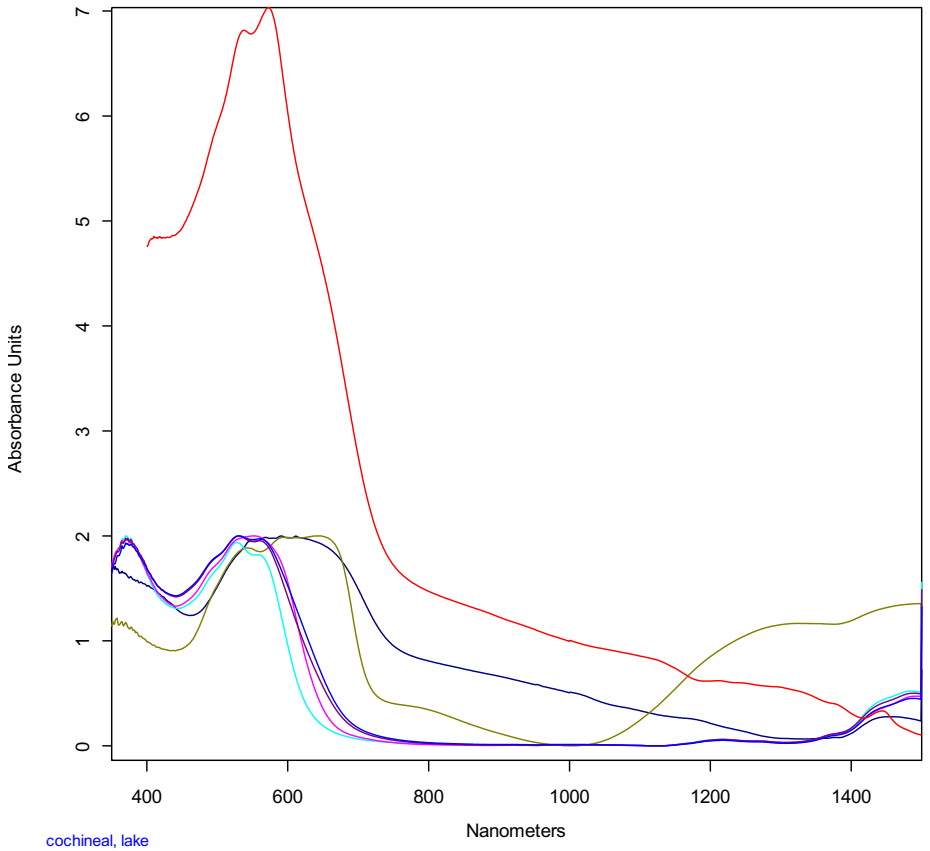


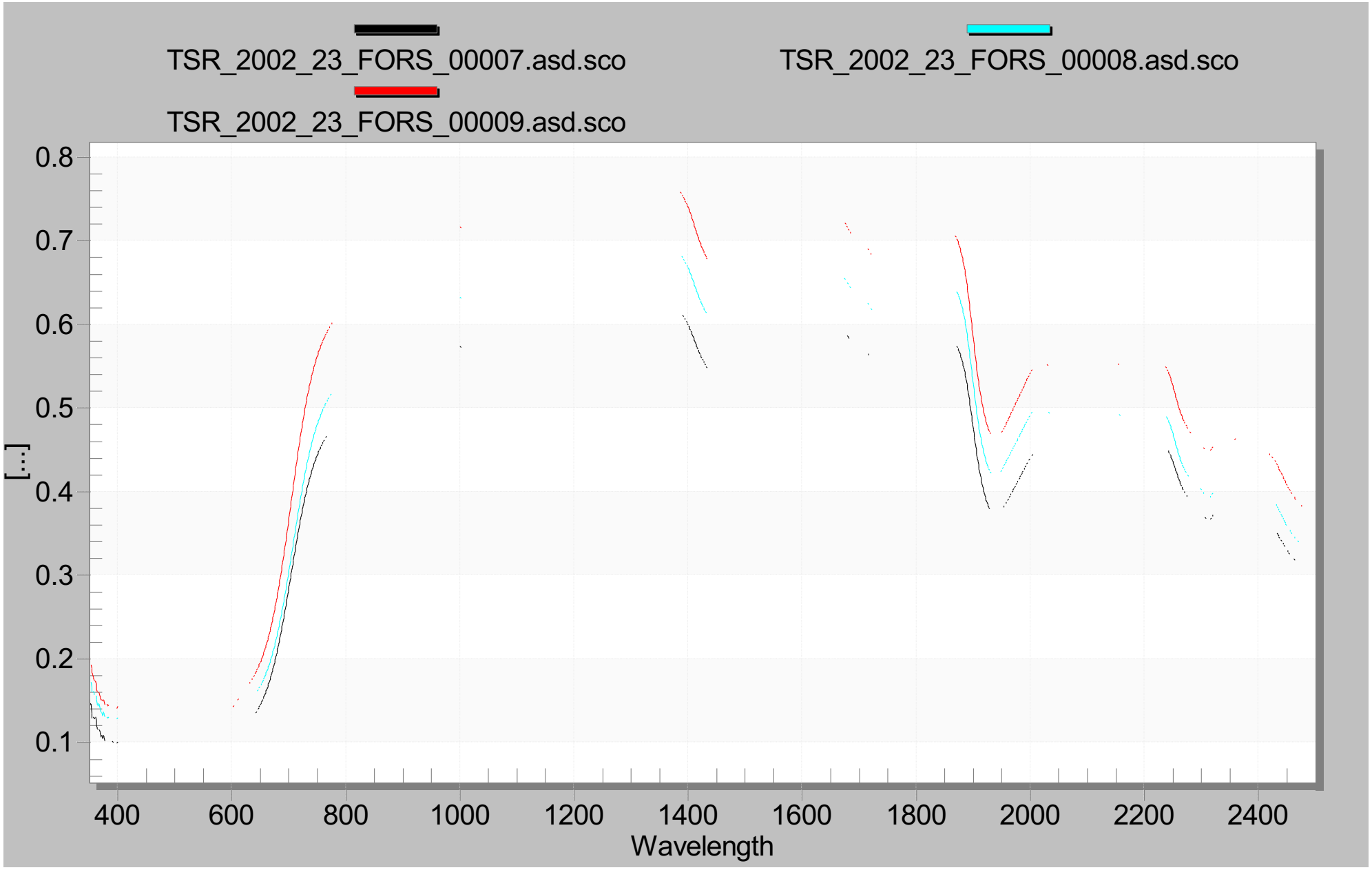
cochineal, lake
cochineal, lake
cochineal
cochineal + chalk
smalt
lapis lazuli (natural)

Compound information	
Compound Name	lapis lazuli (natural)
Molecular Formula	
Molecular Weight	
CAS Registry Number	
Binding Medium	gum arabic
Support	modern parchment
Instrument	ASD
other	CRL_MockManu_00013.asd.sco

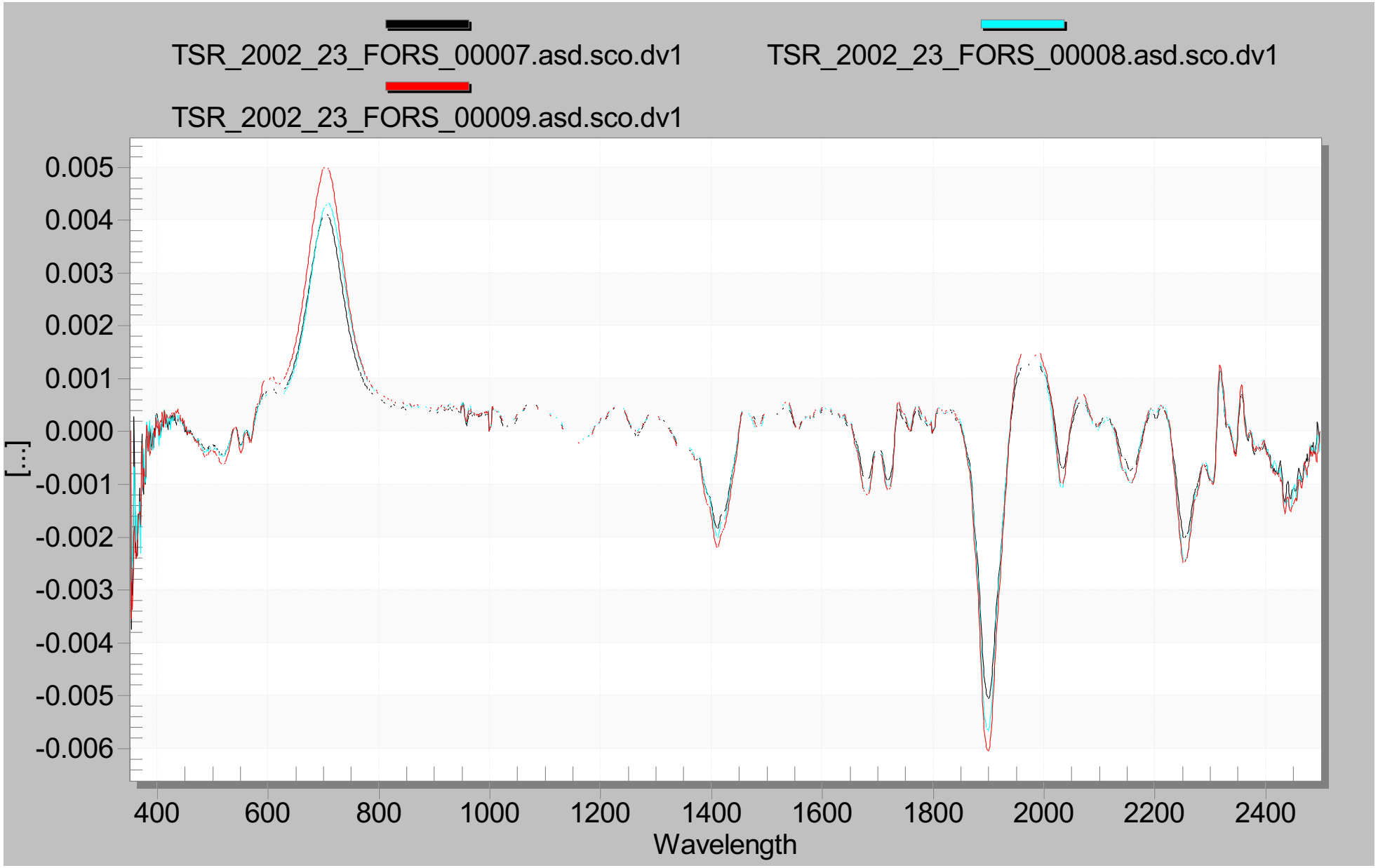
Hit No.	Hit Quality	Compound Name	Entry No.	Lib. Index	Molecular formula	Molecular weight	CAS number
1	607	cochineal, lake	26	4			
2	594	cochineal, lake	25	4			
3	502	cochineal	22	4			
4	498	logwood	38	1			
5	469	cochineal + chalk	24	4			

search on subtracted abs spectrum, 350-1050 nm; mostly insect bases and more cochineal than lac, but less visually aligned than with the refl lac matches…

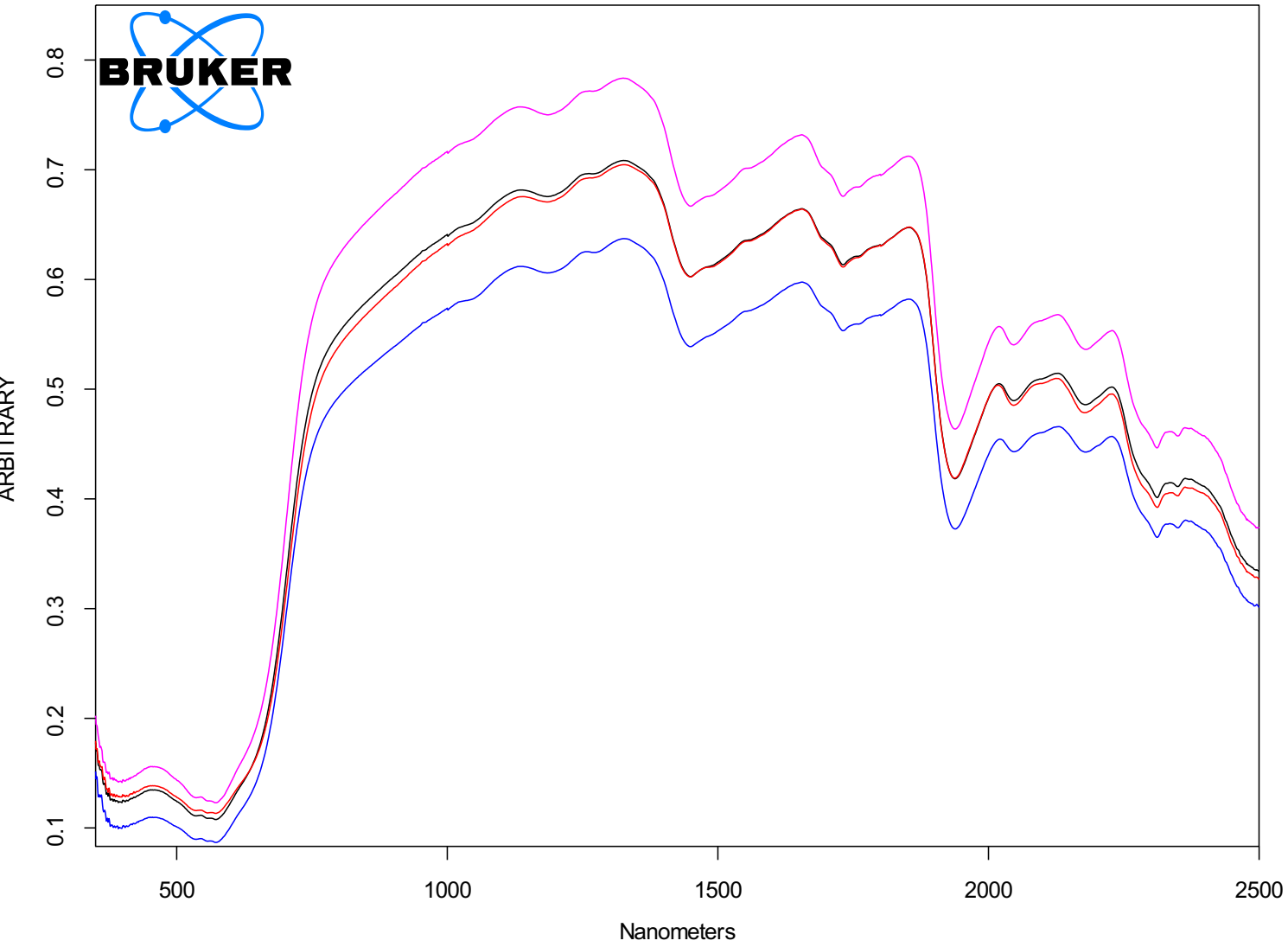
area 14 – purple



area 14 – purple



area 14 – purple



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C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\TSR_2002_23_FORS_00008.asd.sco.dx
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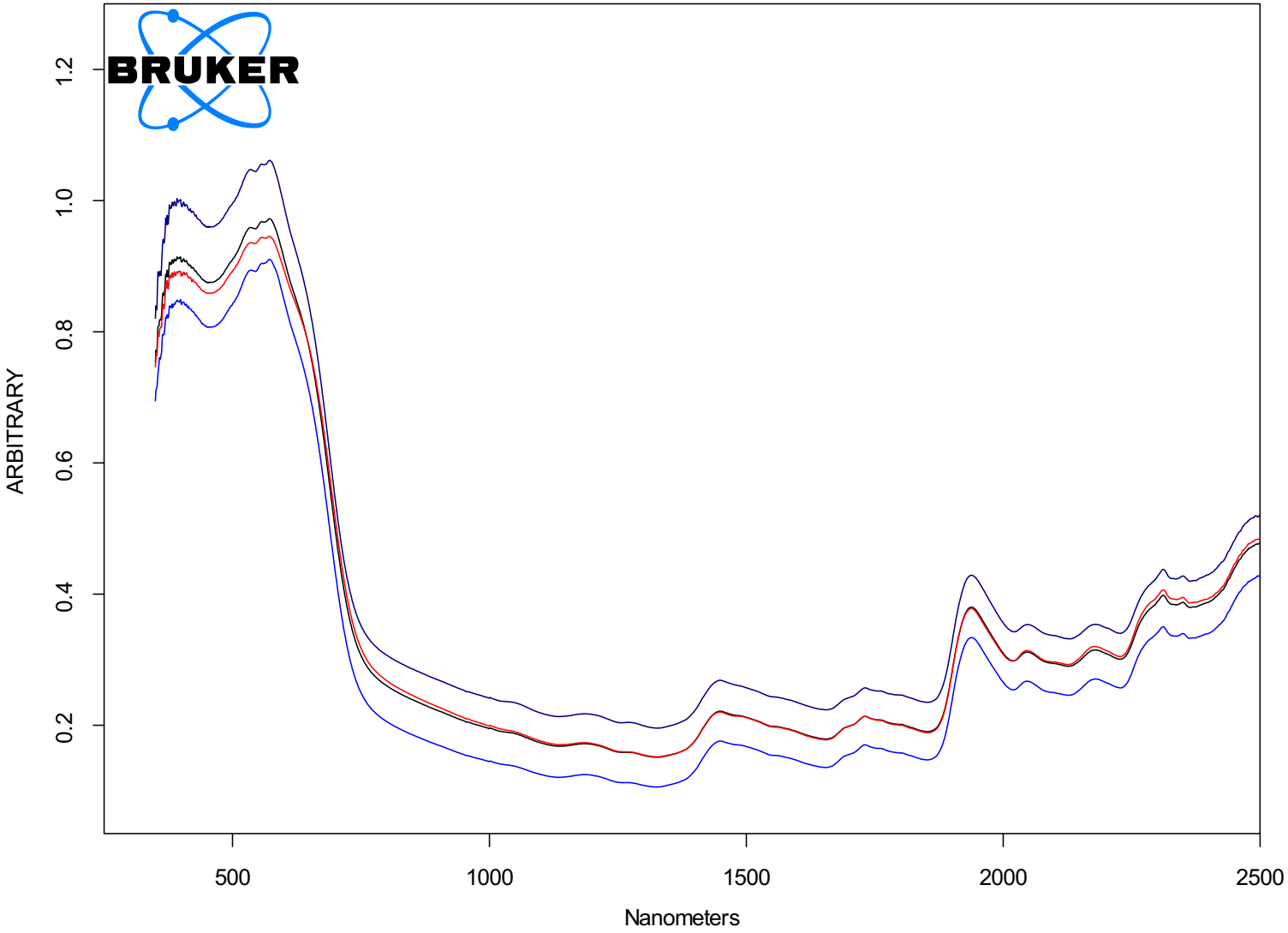
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area14REFL_a

average of 3 spectra

area 14 – purple



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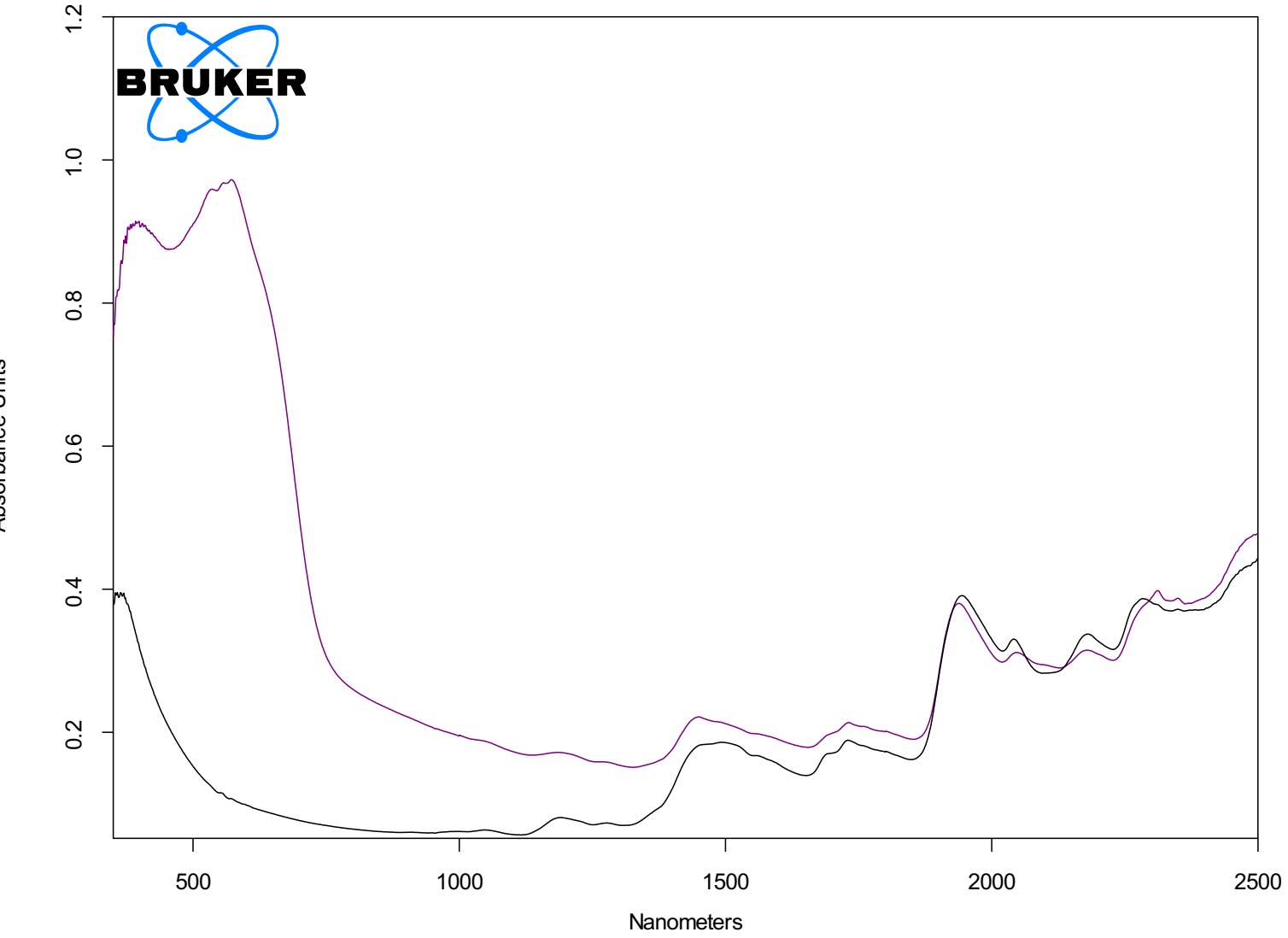
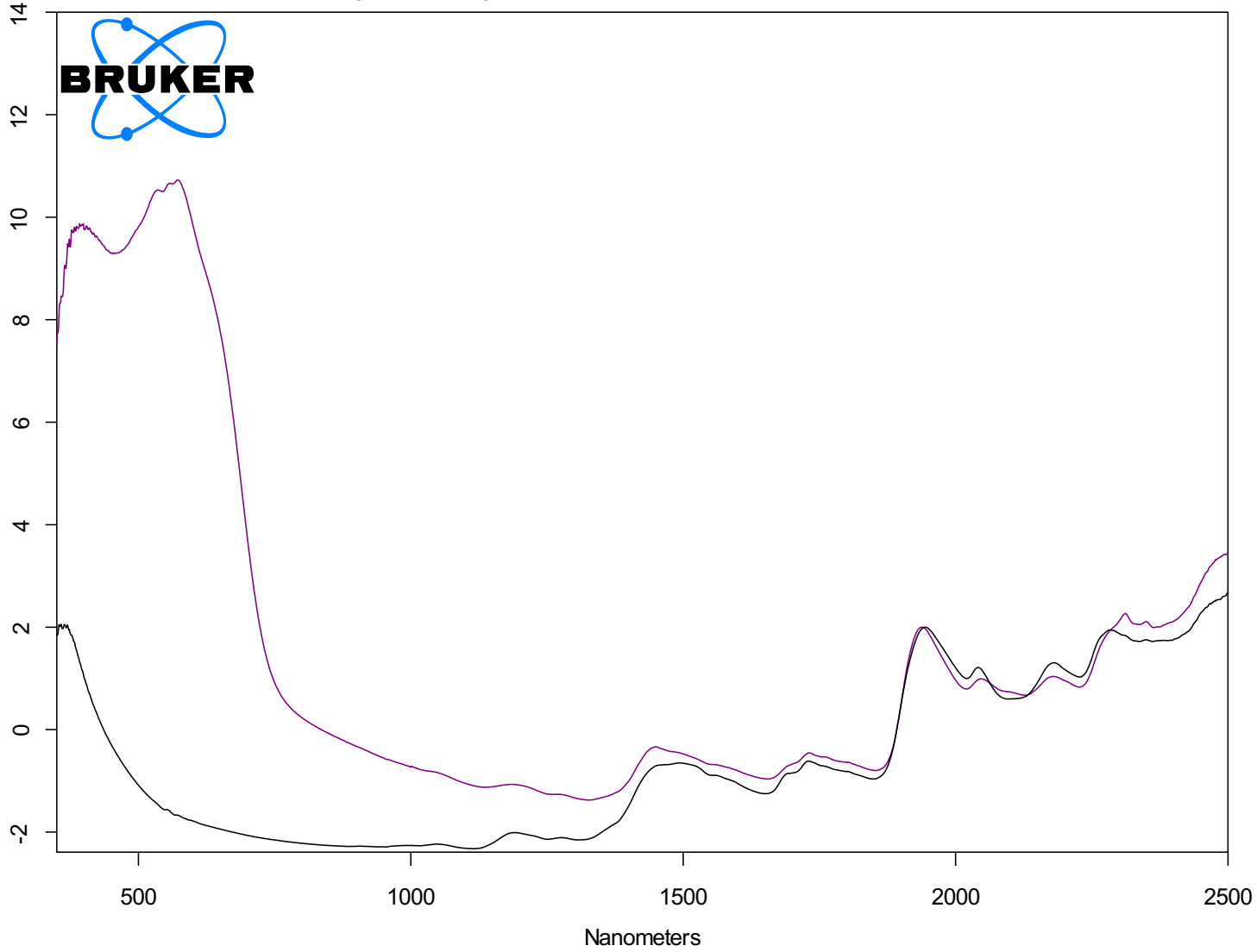
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area14_avg.0	average of 3 spectra

area 14 – purple



C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area15_avg.0	parchment
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area14_avg.0	purple

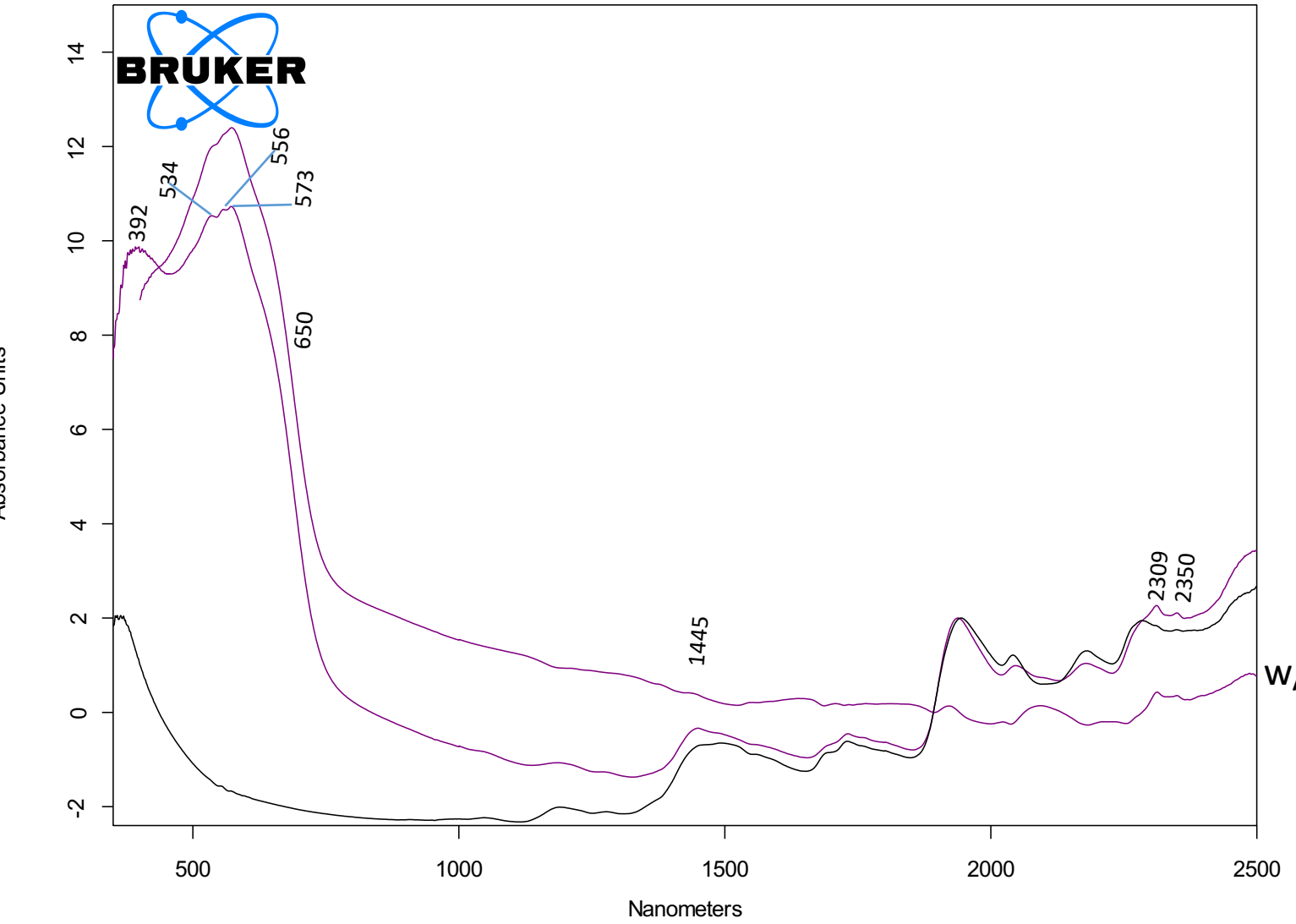
area 14 – purple



normalized to the parchment band at 1940 nm

C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area15_avg.0	parchment
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area14_avg.0	purple

area 14 – purple



normalized to the parchment band at 1940 nm, plus variant w/ parchment subtracted

- possible lead white (weak 1445)
- insect-based red or purple dye since abs bands are high – (520 and 565 vs. 510 and 540 for plant-based); possible combination with a plant-based red giving center band at 556 nm?
- derivative at ~702 nm – possible organic purple?
- trace egg yolk or wax??

w/ parchment subtracted

C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area15_avg.0	parchment
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area14_avg_SU	
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area14_avg.0	purple

area 14 – purple

OPUS/SEARCH **6/24/2016**

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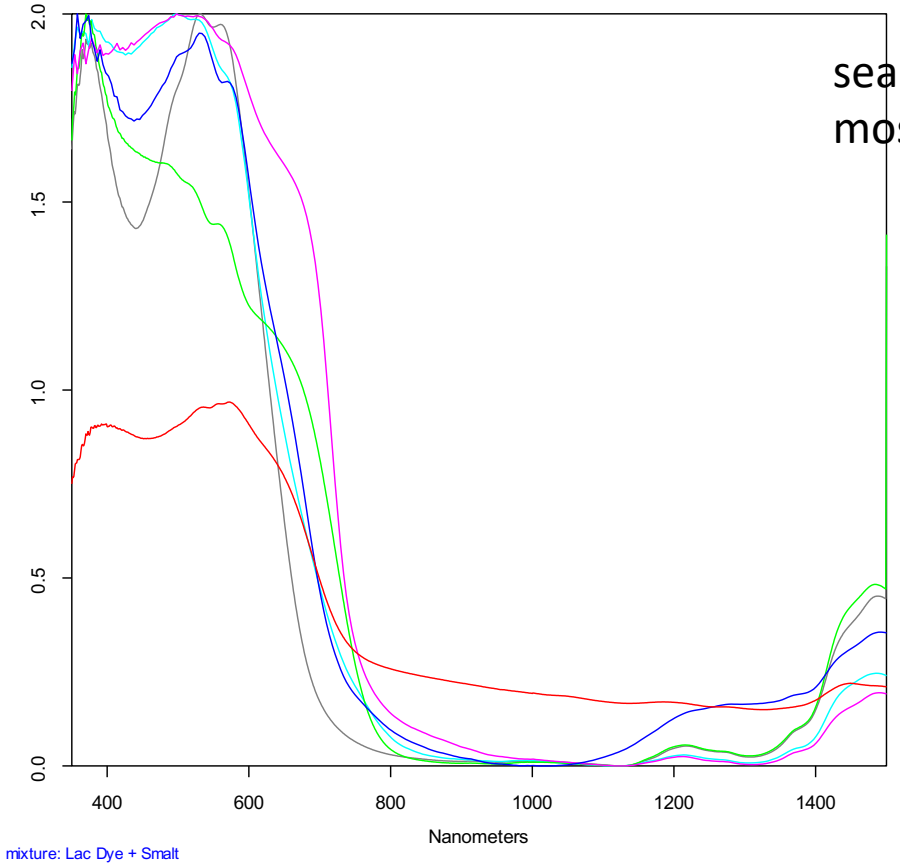

search on refl spectrum, 350-1050 nm;
mostly insect bases

Compound information	
Compound Name	cochineal, lake
Molecular Formula	
Molecular Weight	
CAS Registry Number	
Binding Medium	gum
Support	paper
Instrument	ASD
other	NTorgcolorants_00026.asd.sco

Hit No.	Hit Quality	Compound Name	Entry No.	Lib. Index	Molecular formula	Molecular weight	CAS number
1	572	mixture: Lac Dye + Smalt	170	2			
2	544	cochineal	20	4			
3	514	mixture: Lac Dye + Indigo	169	2			
4	493	cochineal	21	4			
5	489	Lac Dye	57	2			

OPUS/SEARCH

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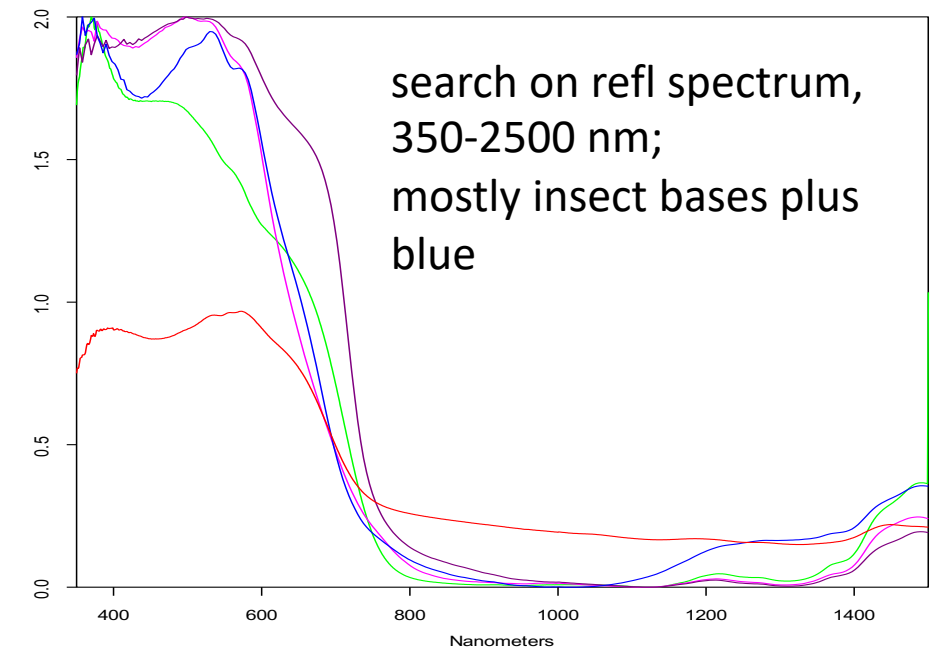

search on refl spectrum, 350-2500 nm;
mostly insect bases plus blue

Hit No.	Hit Quality	Compound Name	Entry No.	Lib. Index	Molecular formula	Molecular weight	CAS number
1	581	mixture: Lac Dye + Smalt	170	2			
2	550	mixture: Lac Dye + Indigo	169	2			
3	545	Lac Dye	57	2			
4	533	cochineal	20	4			
5	515	cochineal	21	4			

area 14 – purple

OPUS/SEARCH **6/24/2016**

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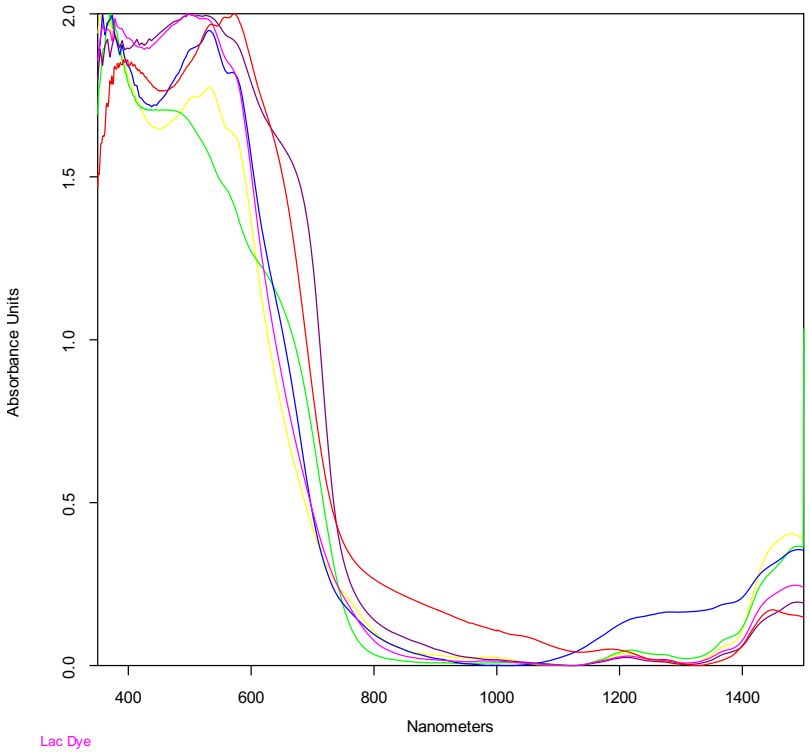

search on abs spectrum, 350-1050 nm;
mostly insect bases, lac is better match.
Lac plus blue?

Compound information	
Compound Name	Lac Dye
Molecular Formula	
Molecular Weight	
CAS Registry Number	
Binding Medium	Gum
Support	Paper
Instrument	ASD Instrument
Light	bifurcated light

Hit No.	Hit Quality	Compound Name	Entry No.	Lib. Index	Molecular formula	Molecular weight	CAS number
1	581	mixture: Lac Dye + Smalt	170	2			
2	550	mixture: Lac Dye + Indigo	169	2			
3	545	Lac Dye	57	2			
4	532	cochineal	20	4			
5	514	cochineal	21	4			

search on abs spectrum, 350-2500 nm;
mostly insect bases, lac is better match.
Lac plus blue?

OPUS/SEARCH

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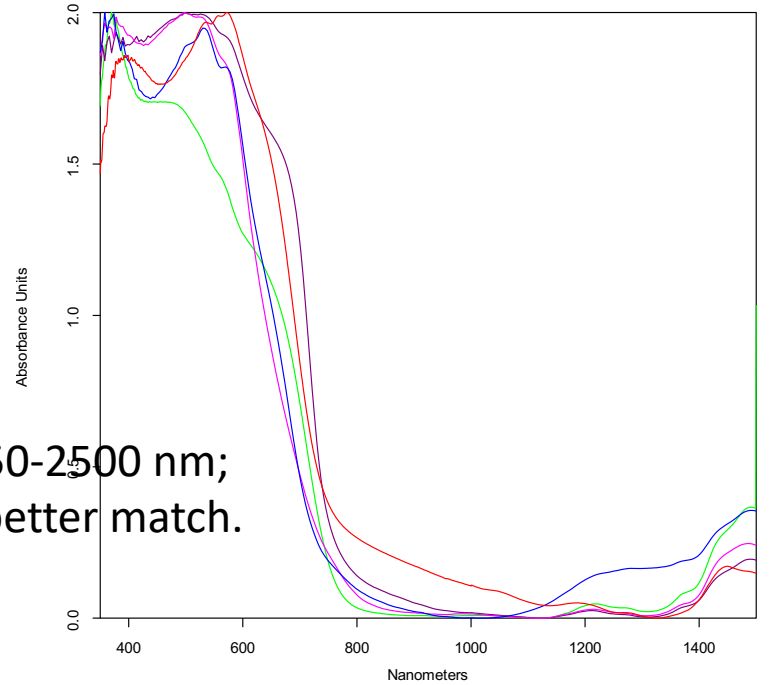

Hit No.	Hit Quality	Compound Name	Entry No.	Lib. Index	Molecular formula	Molecular weight	CAS number
1	581	mixture: Lac Dye + Smalt	170	2			
2	550	mixture: Lac Dye + Indigo	169	2			
3	545	Lac Dye	57	2			
4	532	cochineal	20	4			
5	514	cochineal	21	4			

area 14 – purple

OPUS/SEARCH **6/24/2016**

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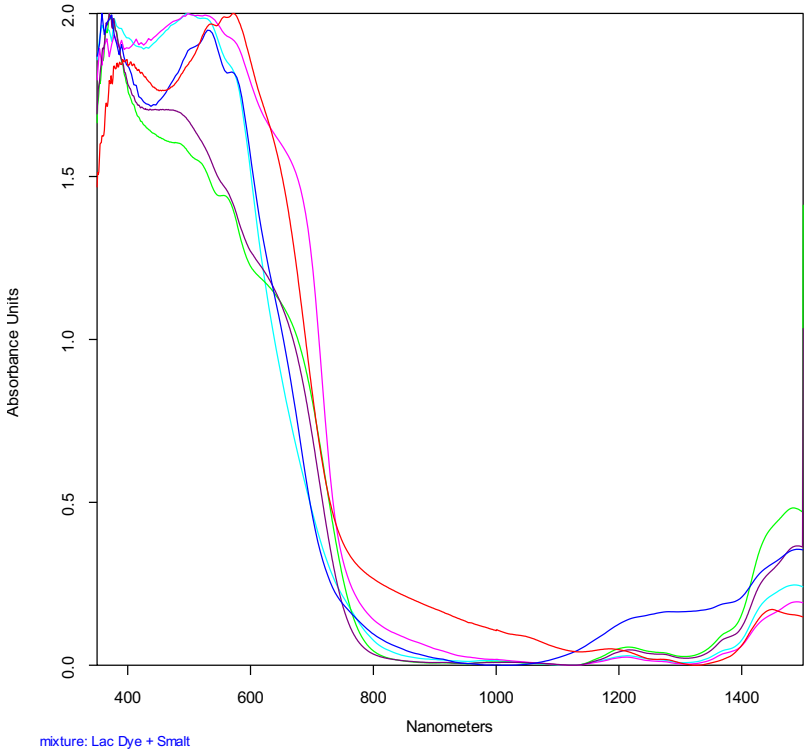

search on subsractecd abs spectrum, 350-1050 nm; mostly insect bases, lac is slightly better match. Lac plus blue?

Compound information	
Compound Name	Lac Dye
Molecular Formula	
Molecular Weight	
CAS Registry Number	
Binding Medium	Glair
Support	Paper
Instrument	ASD Instrument
Light	bifurcated cable

Hit No.	Hit Quality	Compound Name	Entry No.	Lib. Index	Molecular formula	Molecular weight	CAS number
1	572	mixture: Lac Dye + Smalt	170	2			
2	543	cochineal	20	4			
3	514	mixture: Lac Dye + Indigo	169	2			
4	493	cochineal	21	4			
5	489	Lac Dye	57	2			

search on subsractecd abs spectrum, 350-2500 nm; similar…but middle peak is not explained

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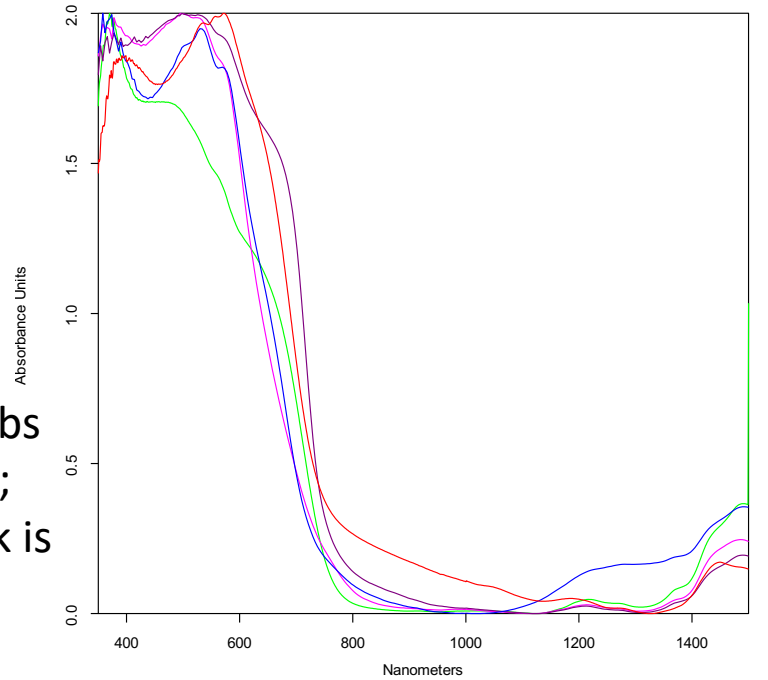
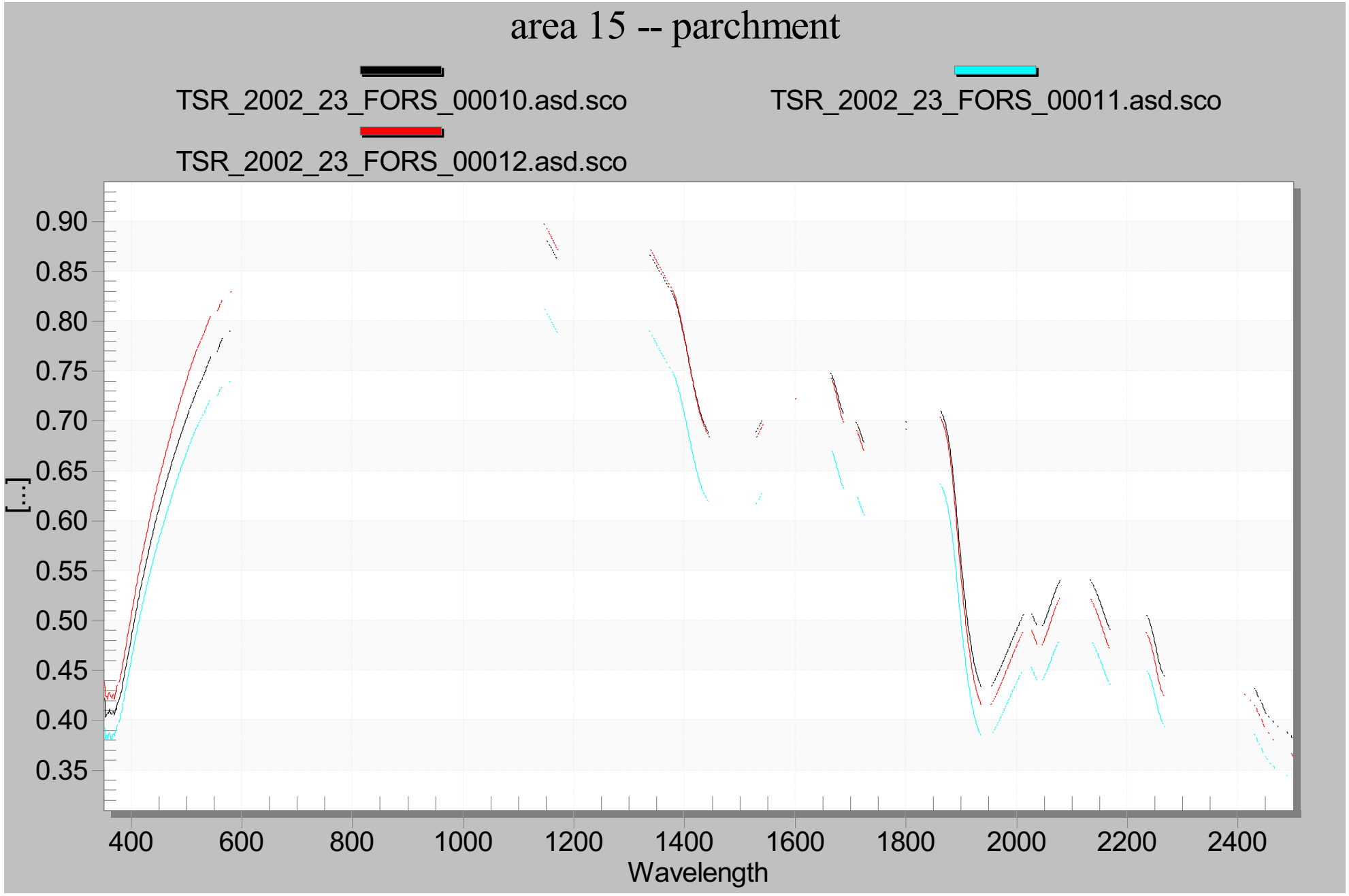
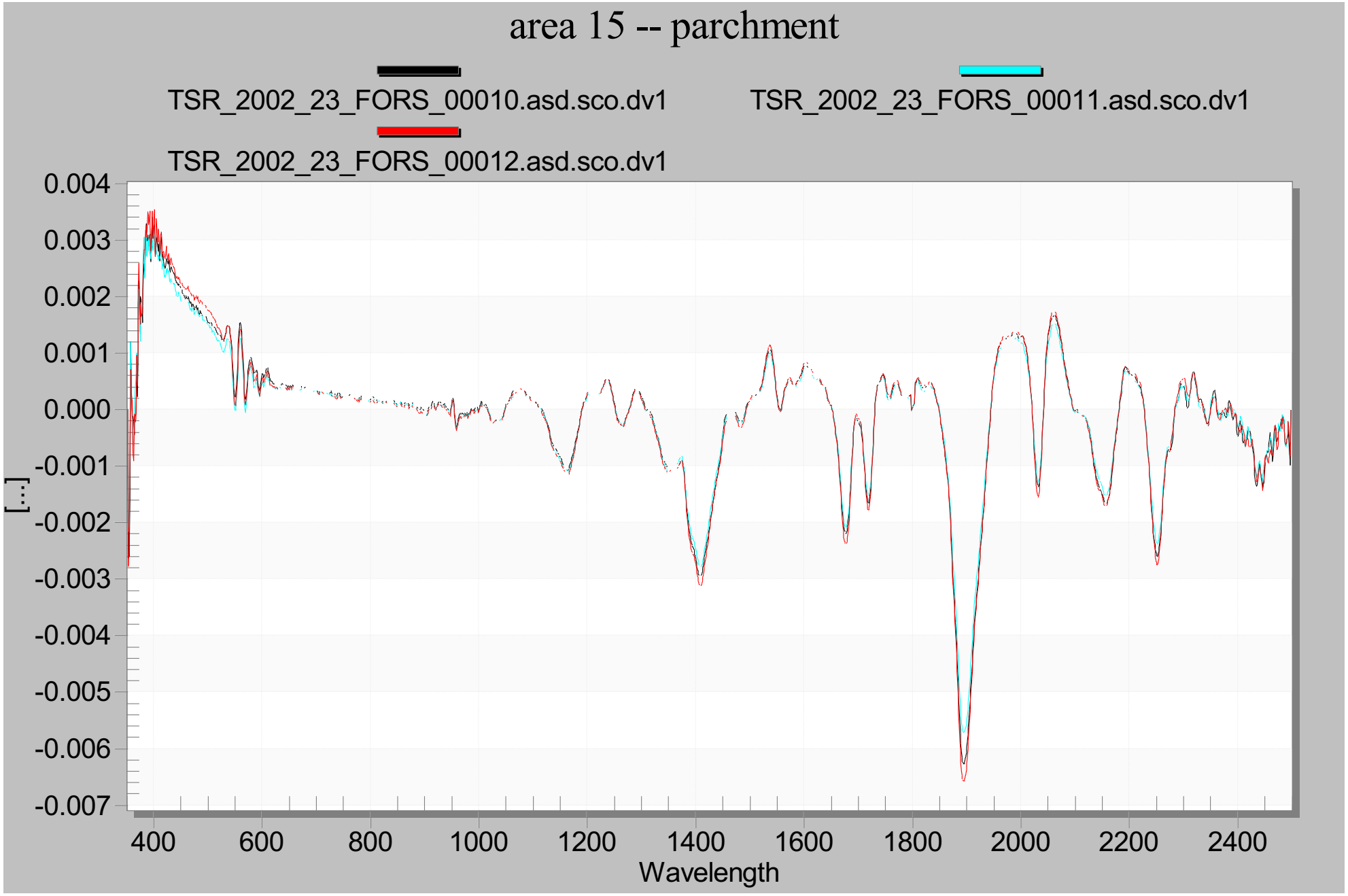


Hit No.	Hit Quality	Compound Name	Entry No.	Lib. Index	Molecular formula	Molecular weight	CAS number
1	581	mixture: Lac Dye + Smalt	170	2			
2	550	mixture: Lac Dye + Indigo	169	2			
3	545	Lac Dye	57	2			
4	532	cochineal	20	4			
5	514	cochineal	21	4			

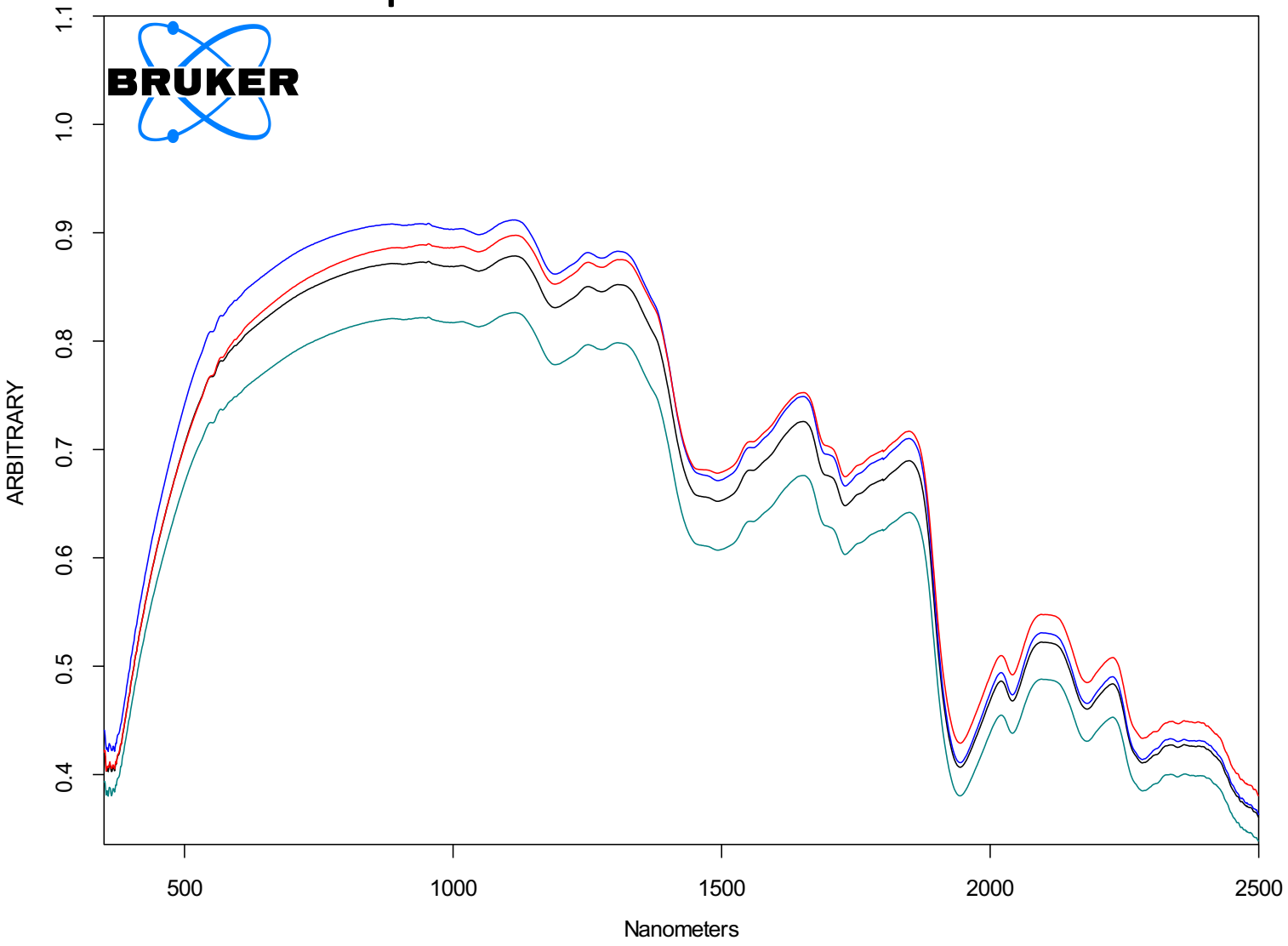
area 15 – parchment



area 15 – parchment



area 15 – parchment



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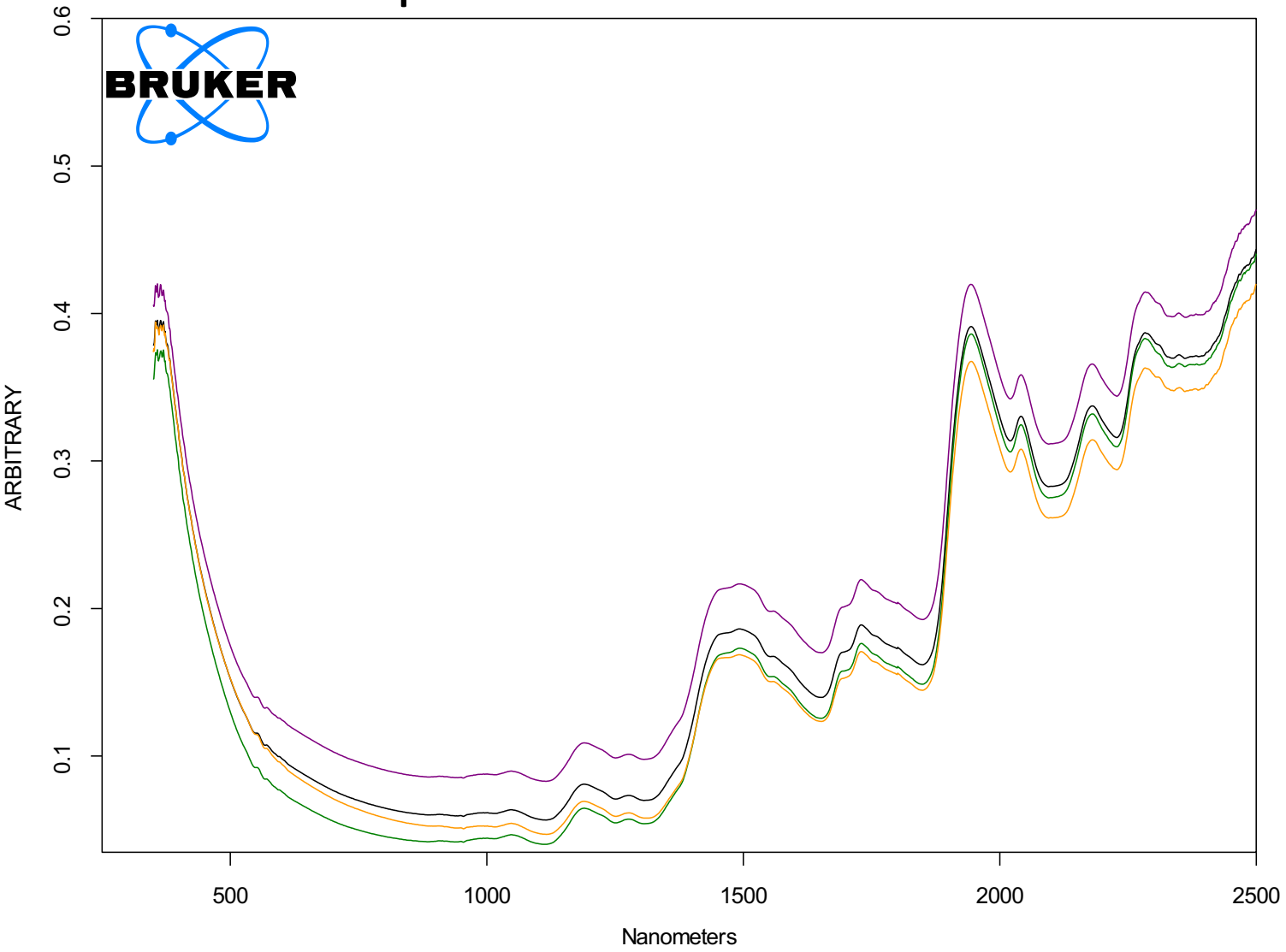
average of 3 spectra

area 15 – parchment



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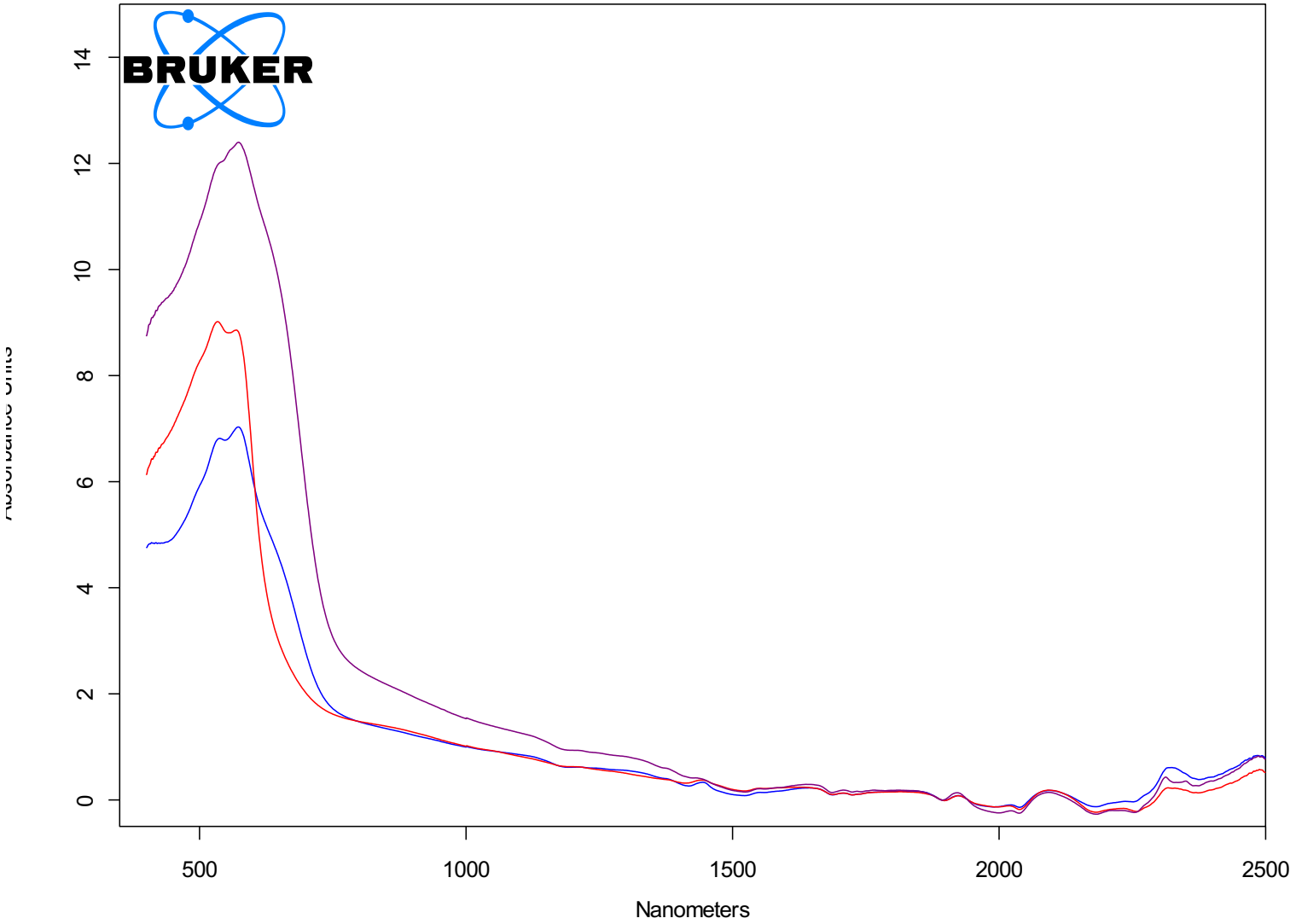
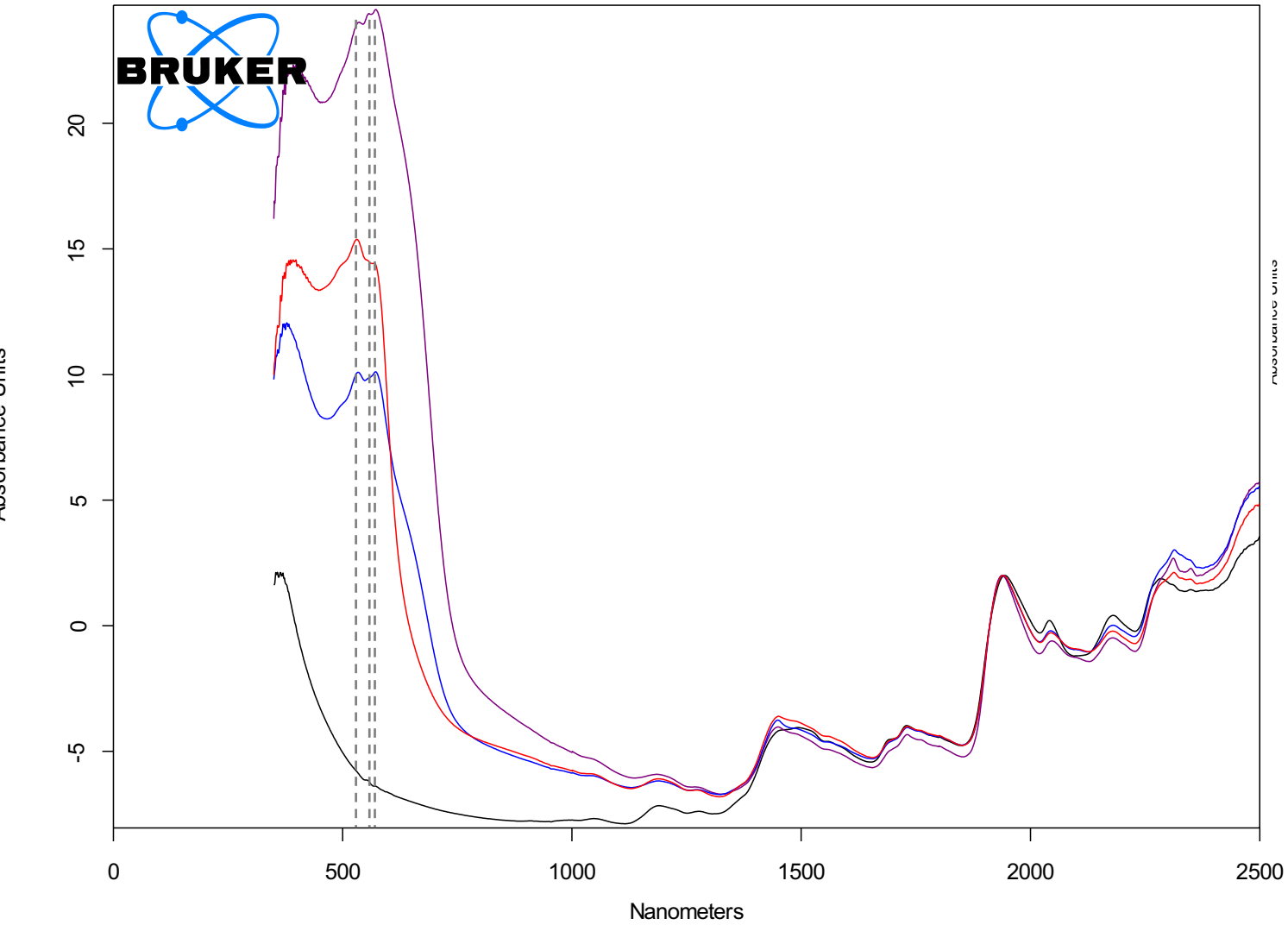
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area15_avg.0	average of 3 spectra

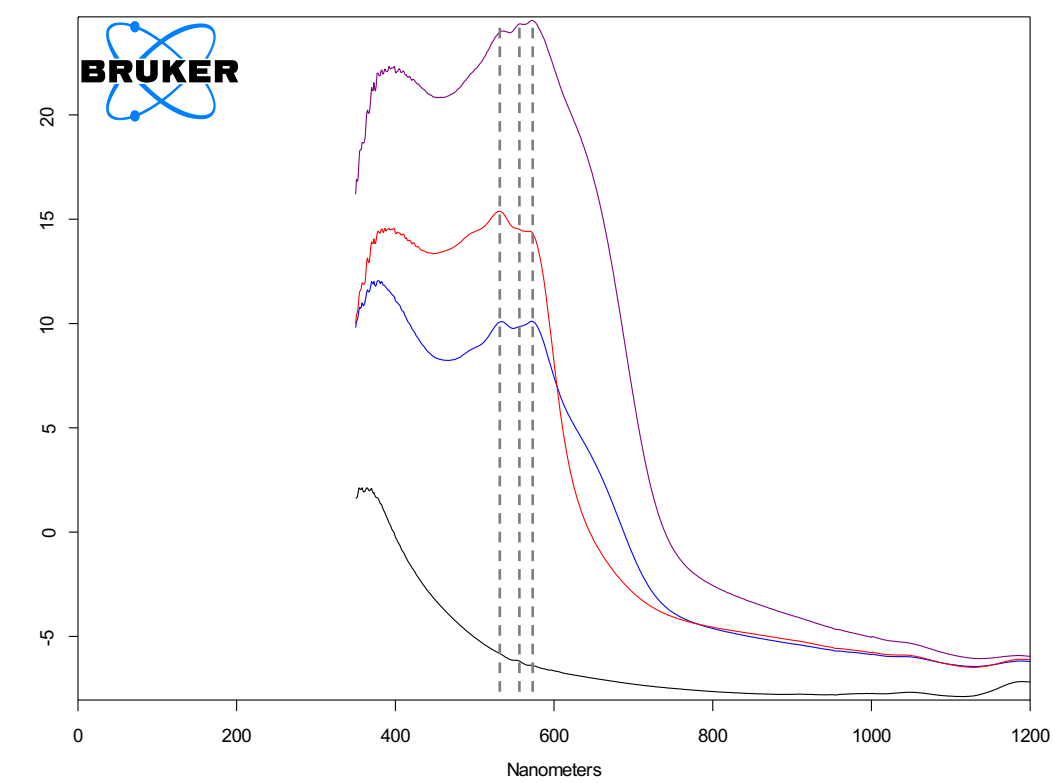
comparisons



C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area14_avg_SU	purple
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area3_avg_SU	red
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area13_avg_SU	purple

comparisons





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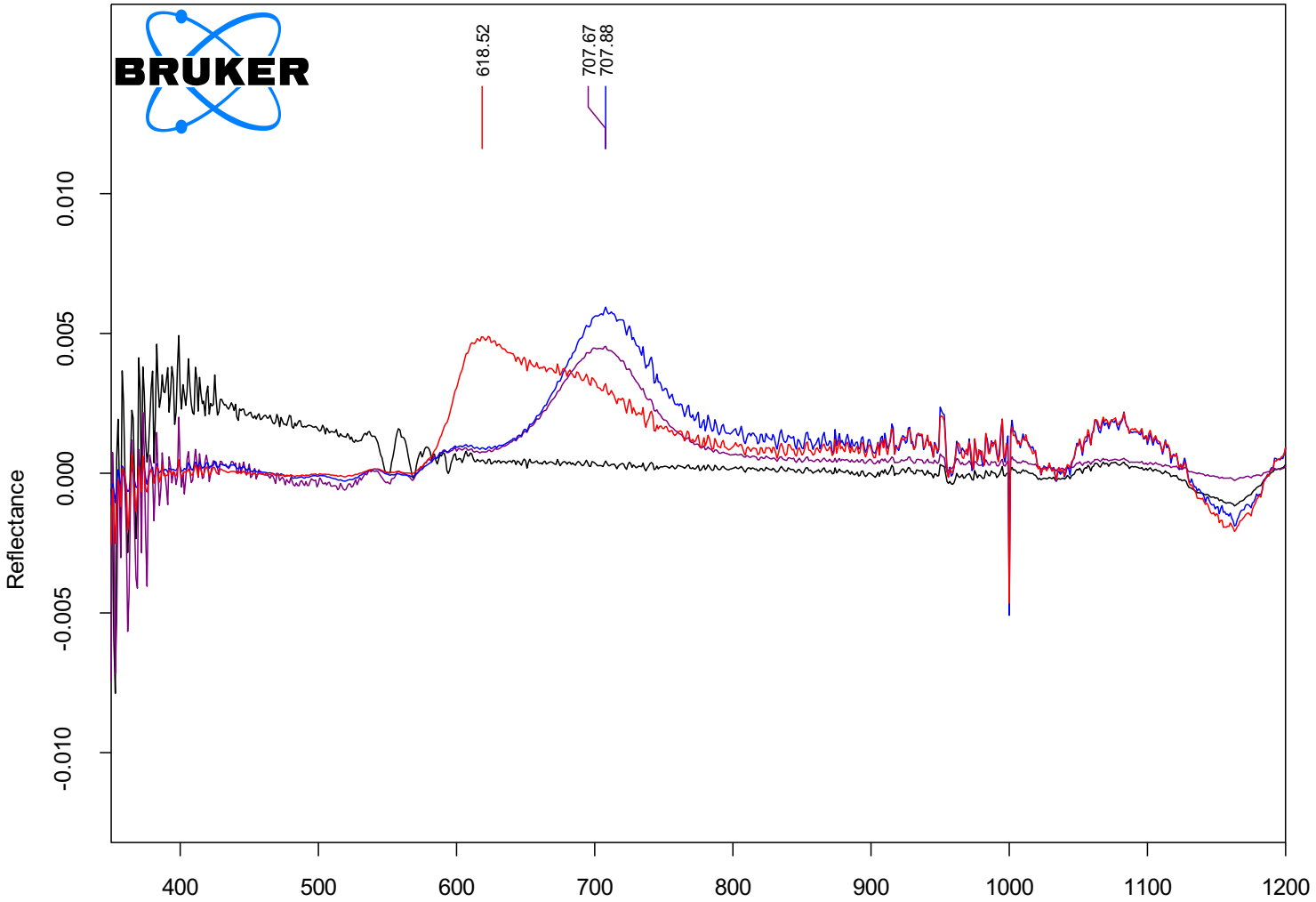
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area3_avg.0	red
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area13_avg.0	purple
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area14_avg.0	purple
C:\Users\cpatterson\Documents\Data\Paper_Manuscripts\ByzantineManus\2002_23_StMark\FORS\final_avgs\TSR_2002_23_FORS_area15_avg.0	parchment

Page 1/1

comparisons



derivative of refl spectrum

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