20231109-StudyOfBloodAndFinger

November 9, 2023

1 Measuring Blood sample on day 09-11-2023

The blood is drawn an put on the thin slide.

Laser power is set at 5.5 (0.39A, 30mW)

The assessment duration is 120 seconds with no accumulation.

Before the analyse, we performed `python3 _preprocess.py -d data/20231109-blood/ --upper_bound 1570 --lower_bound 0` to add meta data and limit the range of spectra

[ ]:
```
import spectrochempy as scp
from glob import glob
```

[ ]:
```
files = sorted(glob(pathname="data/20231109-blood/*"))
files
```

[ ]:
```
['data/20231109-blood/blood_600_785 nm_120 s_1_2023_11_09_12_29_32_01.txt',
 'data/20231109-blood/blood_600_785 nm_120 s_1_2023_11_09_12_32_25_01.txt',
 'data/20231109-blood/blood_600_785 nm_120 s_1_2023_11_09_12_34_53_01.txt',
 'data/20231109-blood/blood_600_785 nm_120 s_1_2023_11_09_12_37_02_01.txt',
 'data/20231109-blood/blood_600_785 nm_120 s_1_2023_11_09_12_39_17_01.txt',
 'data/20231109-blood/blood_600_785 nm_120 s_1_2023_11_09_12_43_39_01.txt',
 'data/20231109-blood/noise_600_785 nm_120 s_1_2023_11_09_11_20_16_01.txt',
 'data/20231109-blood/nothing_600_785 nm_120 s_1_2023_11_09_12_10_47_01.txt',
 'data/20231109-blood/slide_600_785 nm_120 s_1_2023_11_09_12_13_08_01.txt']
```

[ ]:
```
all = scp.read_labspec(files)
all.preferences.figure.figsize = (10, 5)
all
```

[ ]:
```
NDDataset: [float64] unitless (shape: (y:9, x:745))
```

```
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```

```
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No such comm: ed9206b5c97f4187b7f42f97cf9c88bd
No such comm: ed9206b5c97f4187b7f42f97cf9c88bd
```
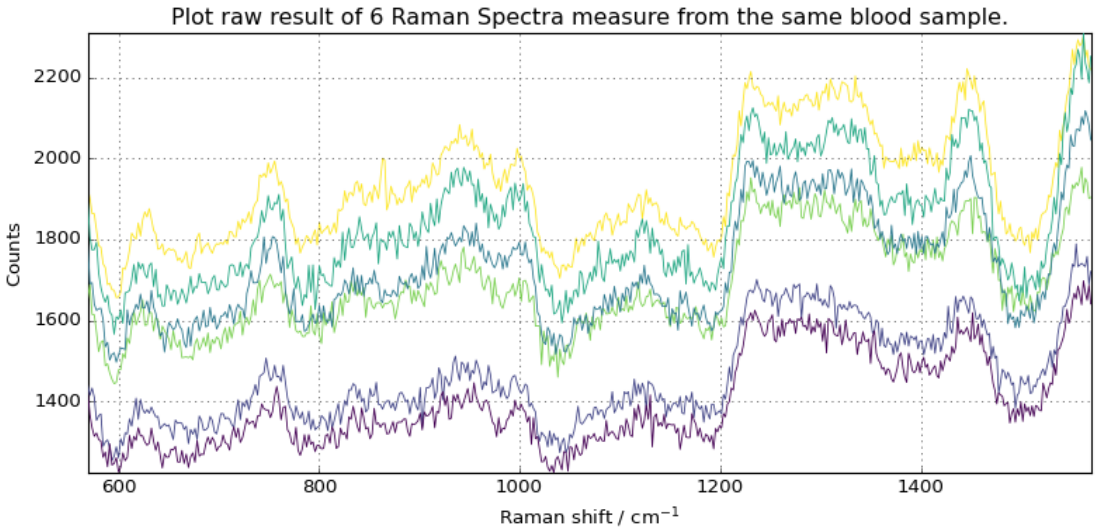
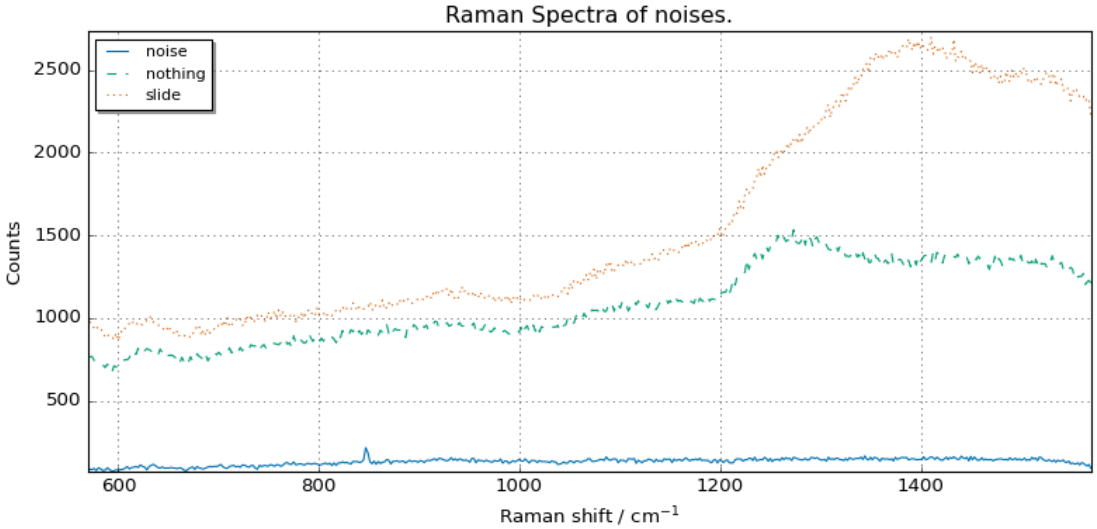

[ ]:
```
blood = all[0:6, 0:500]
noise = all[6, 0:500]
nothing = all[7, 0:500]
slide = all[8, 0:500]
```

[ ]:
```
ax = blood.plot()
ax.set_title(f"Plot raw result of 6 Raman Spectra measure from the same blood␣
 ↪sample.")
ax.grid()
```

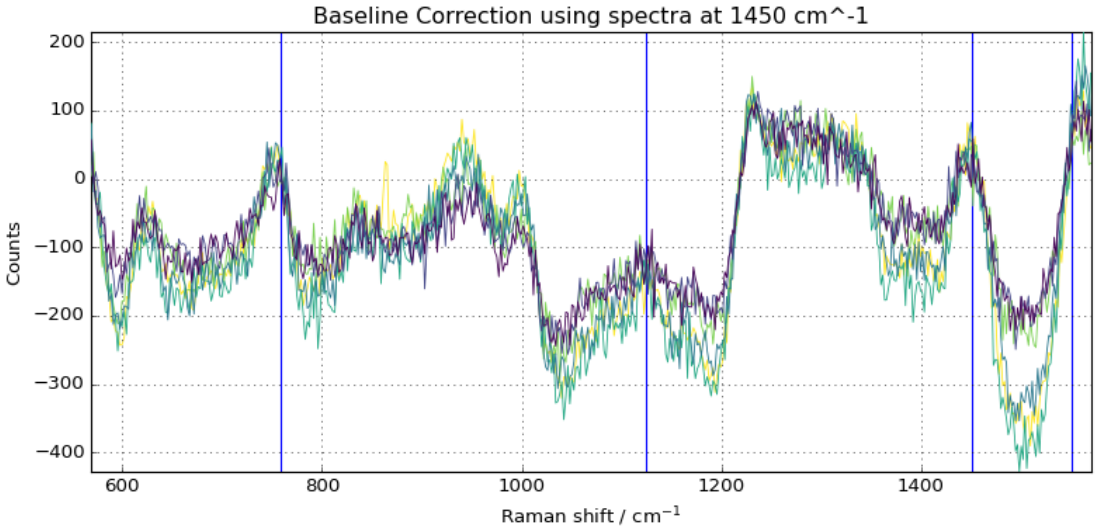


[ ]:
```
ax = scp.plot_multiple(method="pen", datasets=[noise, nothing, slide],␣
 ↪labels=['noise', 'nothing', 'slide'], legend='best')
ax.set_title("Raman Spectra of noises.")
ax.grid()
```

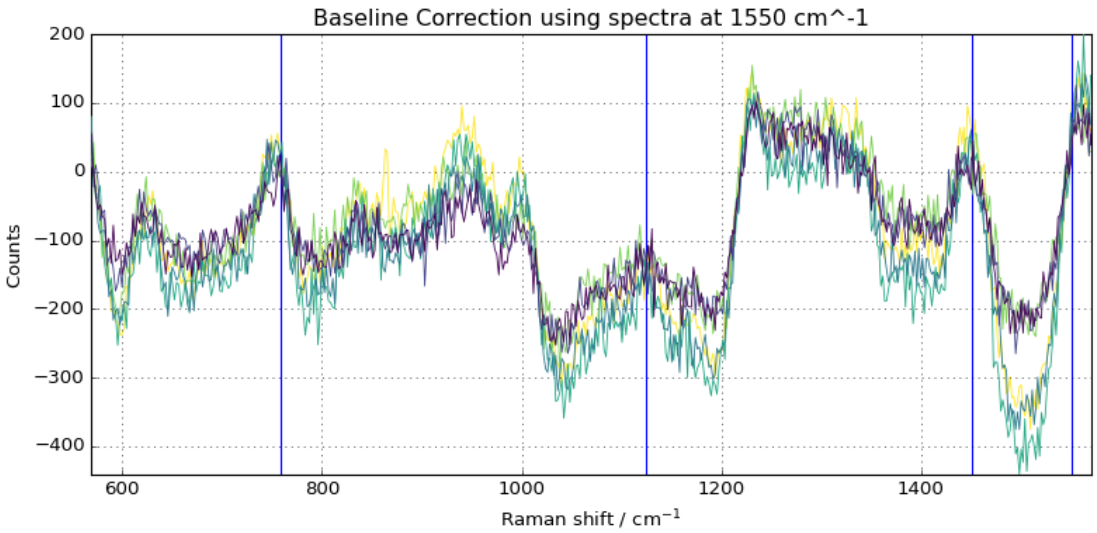


2 Baseline Removal

[ ]:
```
# Baseline at 1450
blc = scp.Baseline(ranges=(1430,1470))
blc.fit(blood)
ax = blc.transform().plot()
ax.vlines(x=1125, ymin=-500, ymax=10000)
ax.vlines(x=759, ymin=-500, ymax=10000)
ax.vlines(x=1450, ymin=-500, ymax=10000)
ax.vlines(x=1550, ymin=-500, ymax=10000)
ax.set_title(f'Baseline Correction using spectra at 1450 cm^-1')
ax.grid()
```

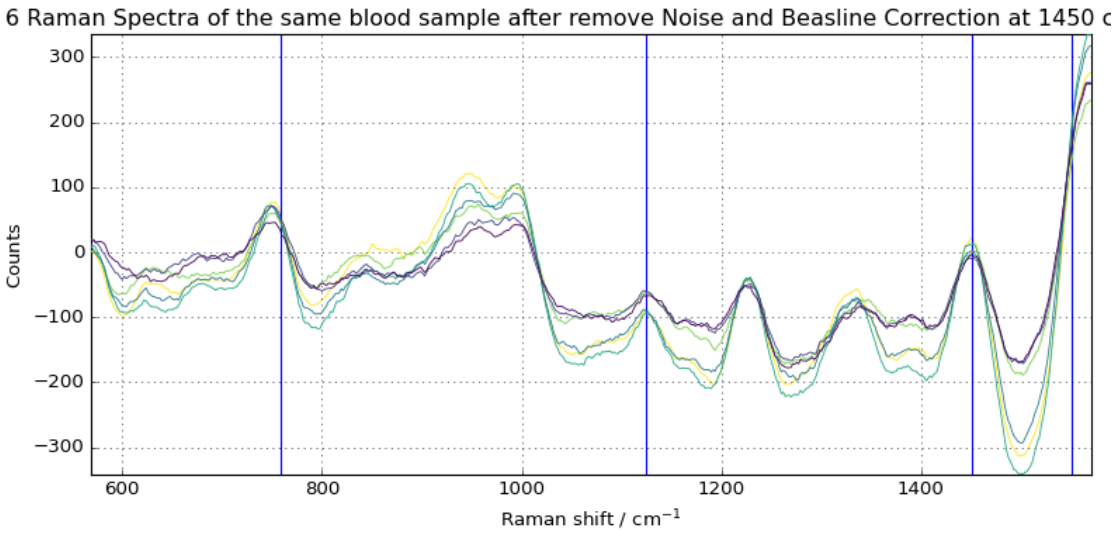


[ ]:
```
# Baseline at 1550
blc = scp.Baseline(ranges=(1530,1570))
blc.fit(blood)
ax = blc.transform().plot()
ax.vlines(x=1125, ymin=-500, ymax=10000)
ax.vlines(x=759, ymin=-500, ymax=10000)
ax.vlines(x=1450, ymin=-500, ymax=10000)
ax.vlines(x=1550, ymin=-500, ymax=10000)
ax.set_title(f'Baseline Correction using spectra at 1550 cm^-1')
ax.grid()
```

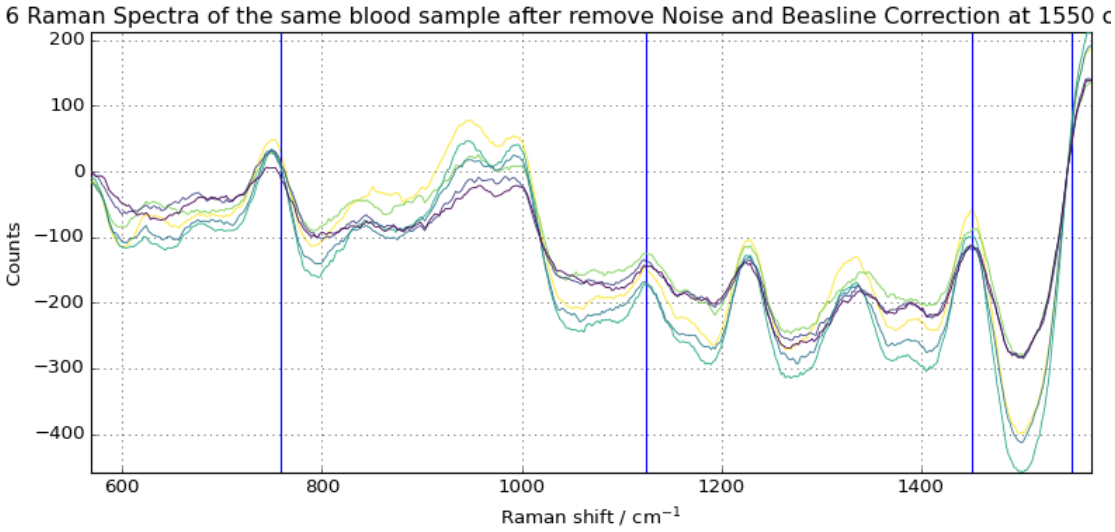


3 Remove Noise then Baseline Correction

[ ]:
```
blc = scp.Baseline(ranges=(1425,1475))
blc.fit(blood - nothing)
ax = blc.transform().smooth(15).plot()
ax.vlines(x=1125, ymin=-500, ymax=10000)
ax.vlines(x=759, ymin=-500, ymax=10000)
ax.vlines(x=1450, ymin=-500, ymax=10000)
ax.vlines(x=1550, ymin=-500, ymax=10000)
ax.set_title(f"6 Raman Spectra of the same blood sample after remove Noise and␣
 ↪Beasline Correction at 1450 cm^-1")
ax.grid()
```



[ ]:
```
blc = scp.Baseline(ranges=(1525,1575))
blc.fit(blood - nothing)
ax = blc.transform().smooth(15).plot()
ax.vlines(x=1125, ymin=-500, ymax=10000)
ax.vlines(x=759, ymin=-500, ymax=10000)
ax.vlines(x=1450, ymin=-500, ymax=10000)
ax.vlines(x=1550, ymin=-500, ymax=10000)
ax.set_title(f"6 Raman Spectra of the same blood sample after remove Noise and␣
 ↪Beasline Correction at 1550 cm^-1")
ax.grid()
```



4 Study the measurement at finger

We keep setting the same

[ ]:
```
# scp.read_labspec()
files = sorted(glob(pathname="data/20231109-finger/*"))
files
```

[ ]:
```
['data/20231109-finger/2index_600_785 nm_120 s_1_2023_11_09_17_55_31_01.txt',
 'data/20231109-finger/2index_600_785 nm_120 s_1_2023_11_09_17_57_49_01.txt',
 'data/20231109-finger/2middle_600_785 nm_120 s_1_2023_11_09_18_00_35_01.txt',
 'data/20231109-finger/2middle_600_785 nm_120 s_1_2023_11_09_18_03_00_01.txt',
 'data/20231109-finger/2nailfold_600_785 nm_120 s_1_2023_11_09_18_05_50_01.txt',
 'data/20231109-finger/2nailfold_600_785 nm_120 s_1_2023_11_09_18_08_11_01.txt',
 'data/20231109-finger/2noise_600_785 nm_120 s_1_2023_11_09_17_50_28_01.txt',
 'data/20231109-finger/2noise_600_785 nm_120 s_1_2023_11_09_18_12_57_01.txt',
 'data/20231109-finger/2nothing_600_785 nm_120 s_1_2023_11_09_17_52_45_01.txt',
 'data/20231109-finger/2nothing_600_785 nm_120 s_1_2023_11_09_18_10_33_01.txt']
```

[ ]:
```
all = scp.read_labspec(files)
all.preferences.figure.figsize = (10, 5)
all
```

[ ]:
```
NDDataset: [float64] unitless (shape: (y:10, x:745))
```

```
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No such comm: 25063f7ba47142d99e8012b6666033ee
```
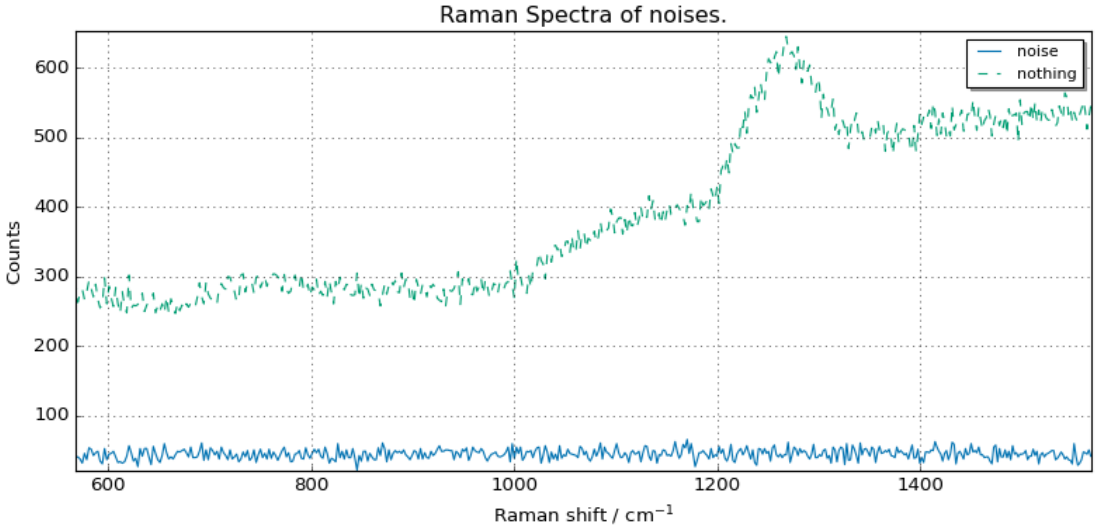
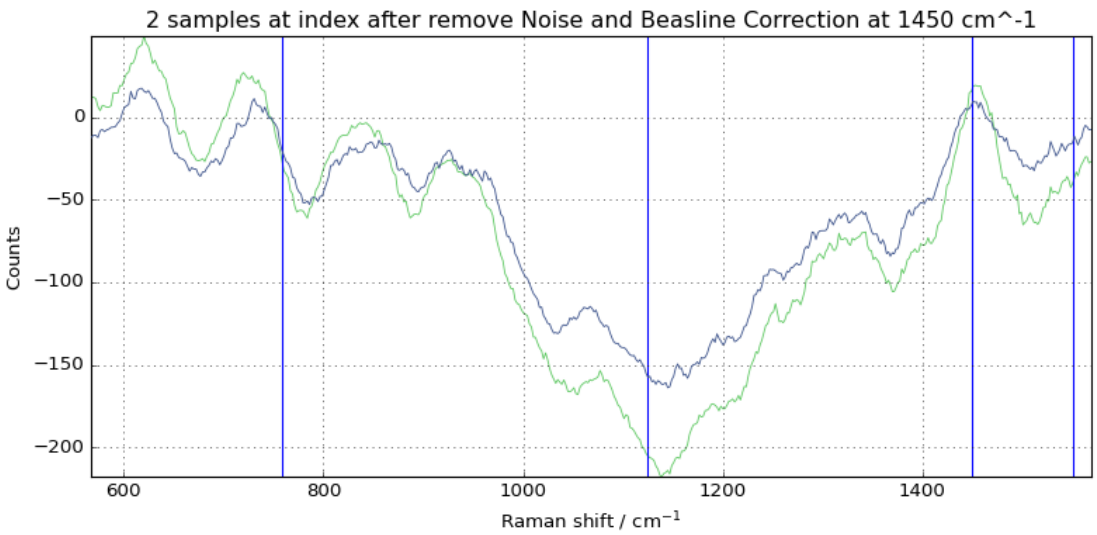

```
No such comm: 25063f7ba47142d99e8012b6666033ee
```

[ ]:
```
index = all[0:2, 0:500]
middle = all[2:4, 0:500]
nailfold = all[4:6, 0:500]
noise = all[6, 0:500]
nothing = all[8, 0:500]
```

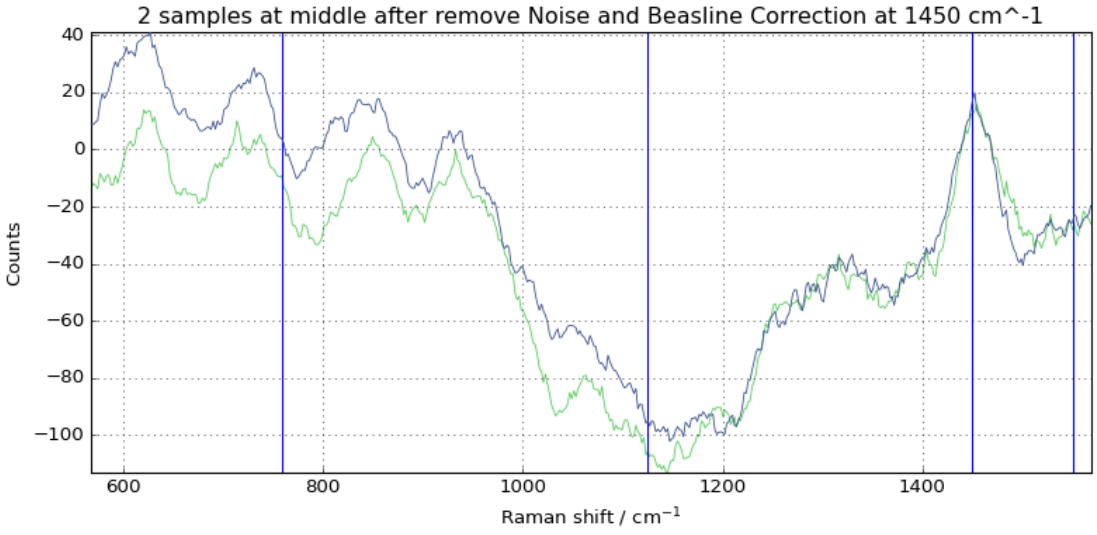
[ ]:
```
ax = scp.plot_multiple(method="pen", datasets=[noise, nothing],␣
 ↪labels=['noise', 'nothing'], legend='best')
ax.set_title("Raman Spectra of noises.")
ax.grid()
```



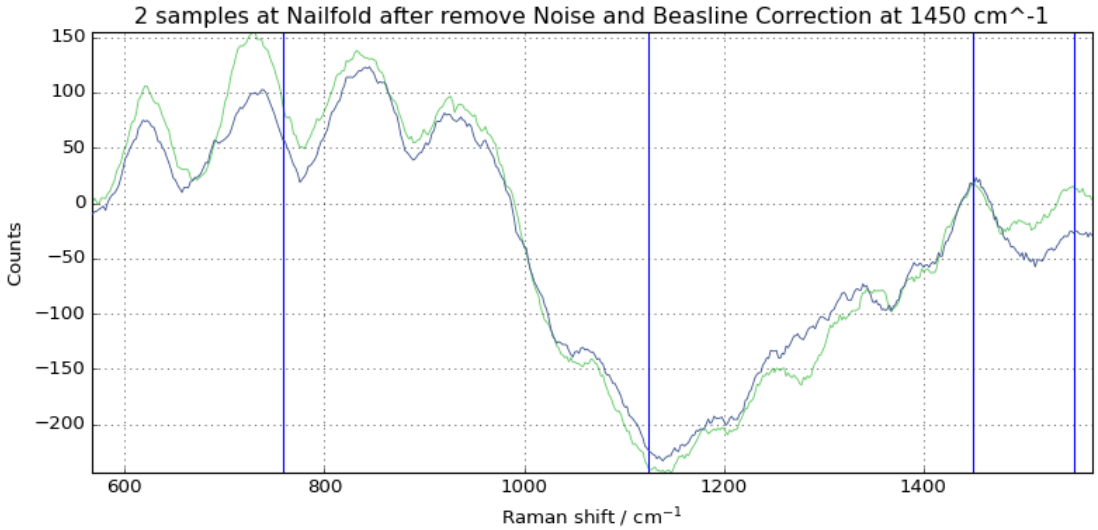
[ ]:
```
blc = scp.Baseline(ranges=(1425,1475))
blc.fit(index - nothing)
ax = blc.transform().smooth(15).plot()
ax.vlines(x=1125, ymin=-500, ymax=10000)
ax.vlines(x=759, ymin=-500, ymax=10000)
ax.vlines(x=1450, ymin=-500, ymax=10000)
ax.vlines(x=1550, ymin=-500, ymax=10000)
ax.set_title(f"2 samples at index after remove Noise and Beasline Correction at␣
 ↪1450 cm^-1")
ax.grid()
```



[ ]:
```
blc = scp.Baseline(ranges=(1425,1475))
blc.fit(middle - nothing)
ax = blc.transform().smooth(15).plot()
ax.vlines(x=1125, ymin=-500, ymax=10000)
ax.vlines(x=759, ymin=-500, ymax=10000)
ax.vlines(x=1450, ymin=-500, ymax=10000)
ax.vlines(x=1550, ymin=-500, ymax=10000)
ax.set_title(f"2 samples at middle after remove Noise and Beasline Correction␣
 ↪at 1450 cm^-1")
ax.grid()
```



[ ]:
```
blc = scp.Baseline(ranges=(1425,1475))
blc.fit(nailfold - nothing)
ax = blc.transform().smooth(15).plot()
ax.vlines(x=1125, ymin=-500, ymax=10000)
ax.vlines(x=759, ymin=-500, ymax=10000)
ax.vlines(x=1450, ymin=-500, ymax=10000)
ax.vlines(x=1550, ymin=-500, ymax=10000)
ax.set_title(f"2 samples at Nailfold after remove Noise and Beasline Correction␣
 ↪at 1450 cm^-1")
ax.grid()
```



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