UV-Visible Spectroscopy for concentration calculation

Date: 2020-01-21
Tags: *14/01/2020Synth UV-Vis Concentration Calibration*
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Goal : Establish a calibration curve of Ti_3C_2 **MXene for UV-Visible spectroscopy**

Procedure :

- Perform serial dilution of bulk Ti_3C_2 MXene suspension from latest synthesis (see [Experiment] MXene synthesis IV) at 13.8 ± 0.3 wt% with a target minimum volume of 5 mL per sample
    - Use disposable 1 mL plastic pipette to transfer a volume of one suspension to an empty glass vial
    - Record mass of suspension added
    - Add a quantity of deionised water to achieve desirable concentration with a separate pipette and record total mass
- Ensure homogeneity with manual shaking
- Add homogeneous solution to quartz cuvette and insert into spectrophotometer ensuring correct orientation and dry outer faces
- Perform scan with speed 480 nm/min and 1 nm data intervals in 200-700 nm range

Results :

Sample N° / #	Mass of previous suspension added / g	Mass of deionised water added / g	Concentration / wt%
1	0.0600	7.2891	1.127×10^{-1}
2	0.3397	6.6106	5.507×10^{-3}
3	1.1368	3.7625	1.278×10^{-3}
4	2.4383	4.0706	4.786×10^{-4}
5	3.7350	3.8273	2.364×10^{-4}
6	4.3455	3.1185	1.376×10^{-4}
7	0.4102	6.4425	8.239×10^{-6}

.csv files are xy data of wavelength vs absorbance, .sp and .rtf files are generated

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by Perkin-Elmer UV Win Lab software and are spectra and a report file, respectively. .png files are plots of the data.

Conclusions:

Samples of concentration ⬜ 5.507x 10^{-3} wt% are not suitable for this spectrophotmeter, as the absorbance exceeds the limits of detection. In samples of concentration ⬜ 1.278 x 10^{-3} wt%, peaks are present across all datasets at 322 and 562 nm. Calibration curves of concentration versus absorbance at each of these wavelengths gives datasets which are well-represented by straight-line plots when excluding the unsuitable samples.

Attached files

21-01-20-full-report-rtf.rtf
sha256: 389c76cc80df924eea5341b6d44c1489bb2031618a30caebfbac651dc3598245

MXene-conc.-3.Sample.Raw.csv
sha256: 3a9b62006703e6ce00685b3d651254c158a2b6ec83475ea1685a0f021156c926

MXene-conc.-3.Sample.Raw.sp
sha256: 417ca301b3928474447afcd03d7f2d2d496af721a44b6e2bfa1869acc6d83f01

MXene-conc.-4.Sample.Raw.csv
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MXene-conc.-4.Sample.Raw.sp
sha256: 263ca0a62150412bb3d37cc0714e983872d5349b8a7a243afcee280694b770d8

Mxene-conc.-5.Sample.Raw.csv
sha256: a03ec8c3aa9654594b439ef569df60a5e5a9740163e3b7c39d51bac519e97946

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sha256: f07f91cc80b79e19712464b35f8db60ba41a7f8852751580ced1db0b50618aba

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Mxene-conc.-6.Sample.Raw.csv
sha256: 186e982554fca1b70d8f91940465cc6cd1bff8148046d39ccb33ba35cb2c7b2e

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MXene-conc.-7.Sample.Raw.csv
sha256: 87d54404286e180a1893c911acbf7ba9bbdd51d697681c8e5165ed97443d61d4

100-or-0-Absorbance-Baseline.Correction.Raw.csv
sha256: 8154e252dac84523a939b844438a06580380da80e9a422d7ecd8c0e7af10e936

MXene-conc.-7.Sample.Raw.sp
sha256: bc04d441e86b313d1376a50cbcd4292713e154a8e398c50296b1fc2747fc22db

100-or-0-Absorbance-Baseline.Correction.Raw.sp
sha256: 1692402d1d3b518251c201e97b71364bee88a03dbbb9d23b1768f92ac7bf3180

MXene-conc.-1.Sample.Raw.csv
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MXene-conc.-1.Sample.Raw.sp
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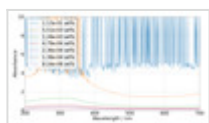
MXene-conc.-2.Sample.Raw.csv
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MXene-conc.-2.Sample.Raw.sp
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UVVis200121.png
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UVVis200121ylim.png
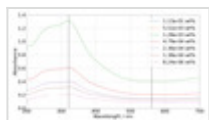sha256: f590b5b323edbd4465933f35825cfe29d7b73b9b96be7f26fedb687129c47dbf
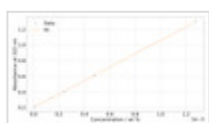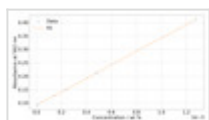
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UVVis200121_322nmAbs.png
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UVVis200121_562nmAbs.png
sha256: 5bb3c8bcec005b8ef5a91d147cf45a9304508e972c9fbf6049d8bd31e452921a

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Link: https://frankel-elab.manchester.ac.uk/experiments.php?mode=view&id=37