UV-Visible Spectroscopy for concentration calculation I

Date: 2022-01-31
Tags: *14/01/2020Synth UV-Vis Concentration Calibration*
Created by: James Bird

Goal : Re-establish a calibration curve of Ti_3C_2 **MXene for UV-Visible spectroscopy by performing scans across the complete wavelength range of the spectrophotometer**

Procedure :

- Produce an intermediate concentration suspension between the target values and the bulk Ti_3C_2 MXene suspension from latest synthesis (see [Experiment] MXene synthesis IV) up to ~ 25 mL
  - 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
- Use above method to produce all more dilute suspensions from this one intermediate (Sample #13 below) with a target volume of ~ 15mL per concentration
- 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 200-1000 nm range
- When samples not in use they are degassed, sealed and stored refrigerated

Results :

Sample N° / #	Mass of suspension added / mg	Mass of deionised water added / g	Concentration / wt%
13	102.1 (from bulk suspension)	25.9496	5.430×10^{-2}
8	183.3	16.3722	6.079×10^{-4}
9	222.3	16.3410	7.387×10^{-4}

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10	264.0	16.7162	8.576×10^{-4}
11	286.4	15.4176	1.009×10^{-3}
12	337.4	16.0314	1.047×10^{-3}
3.1	343.1	14.6003	1.276×10^{-3}
4.1	125.4	14.1804	4.802×10^{-4}
5.1	80.7	18.2449	2.402×10^{-4}
6.1	29.7	11.5107	1.401×10^{-4}
7.1	35.5	31.7034	6.080×10^{-5}

.csv files are xy data of wavelength vs absorbance, .sp and .rtf files are generated by Perkin-Elmer UV Win Lab software and are spectra and a report file, respectively. .png files are plots of the data.

Conclusions:

All sample concentrations are suitable for this spectrophotometer. Consistent peaks are again identified present at 322 and 562 nm. On extending the data range to 1000 nm, another consistent peak is identified at average position 742 nm.

Attached files

KaiKai-Ti3-MILD.rtf
sha256: 64344ed4c7e28f00953e465d8fa5d03dd2bcfb44a49853af9a1911ac419b1068

8.Sample.Raw.csv
sha256: fcc99f7a865babe0fb98eeb94eb8f63d0840307bef291c5e6928db03fe9360a8

9.Sample.Raw.csv
sha256: 9182dc4b28f7bb68119a492444c42854f8aa949cfee1ee975356869916869ff3

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10.Sample.Raw.csv
sha256: 3120a0da672ab4d3abec92bf323e477e10ffbb9fe77fac5ca6aa85a4a7e0cee5

11.Sample.Raw.csv
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12.Sample.Raw.csv
sha256: 8f2e22ab6c58e8f4dfcabd5f2f55c3f4d5e046c0a88989662415089378b6506f

100-or-0-Absorbance-Baseline.Correction.Raw.sp
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7.1.Sample.Raw.sp
sha256: 1df0c2d29a2695867accd8d34c010881dc54919dec5dfb083375253a29457382

3.1.Sample.Raw.sp
sha256: 11a7cd1b77edcf859d0545c369958c8f3089644468c5b6d20ce8f51436b446f0

4.1.Sample.Raw.sp
sha256: 4f21ebd38a4ff38f89da88c8008a1e2a58c85afde10ba11af54d0094759d9101

5.1.Sample.Raw.sp
sha256: ee006a3ef950b131164dffd85505ef5e1b2acd2c373b0c66c1eec73ea2134e30

6.1.Sample.Raw.sp
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10.Sample.Raw.sp
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11.Sample.Raw.sp
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12.Sample.Raw.sp
sha256: a7c967e909adc1a3f7d80795154047e0c8fc0a6f728670e3a5b96c56c2bbe3b0

8.Sample.Raw.sp
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9.Sample.Raw.sp
sha256: d42b4acec0e3e56865c40d38ae9cf75a23bfe79c21a54d6a25d44bc7890f7f45

100-or-0-Absorbance-Baseline.Correction.Raw.csv
sha256: 0178d80b4aec7bbb5eef0a17a9834b201bf899b41499200fdfff8b68c7e6d866

3.1.Sample.Raw.csv
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5.1.Sample.Raw.csv
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6.1.Sample.Raw.csv
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7.1.Sample.Raw.csv
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UVVis200204_562nmAbs.png
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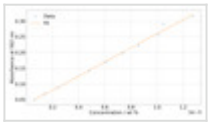

UVVis200204_742nmAbs.png
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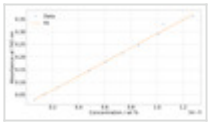

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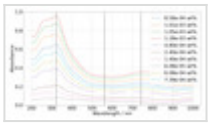

UVVis200204_322nmAbs.png
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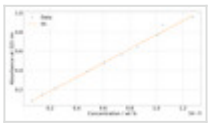

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Link: https://frankel-elab.manchester.ac.uk/experiments.php?mode=view&id=43