

PEMBROKE INSTRUMENTS, LLC

U.S. Product Information & Quotations

Manufactured by INDATECH | Chauvin Arnoux Group

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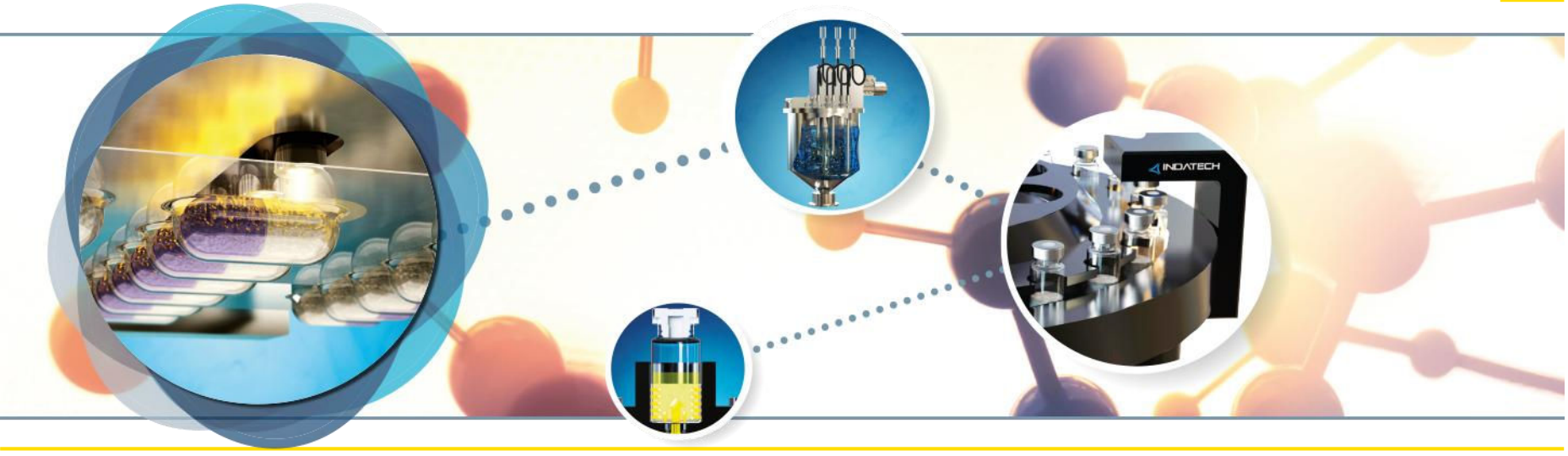
CHAUVIN ARNOUX
INDATECH

Sensitivity analysis of Asuryan to alcohols/ketones



CHAUVIN ARNOUX
GROUP

Mesurer pour mieux Agir

Your new solution: Asuryan UV/VIS

CHAUVIN ARNOUX
INDATECH



- Stainless steel enclosure, IP54, dual channel, hygienic design, easy to clean, conform USP 857
- SMA connector with UV optical fiber
- High end innovative UV light source with internal shutter and operator safety
- Measuring range 200 – 800 nm
- Compatibility with flow cells and immersion probes on the market
- Different acquisition modes possible according to your applications : batch monitoring, continuous process, high stability option, identification of raw material, detection of contamination …



Flow cell



Probe

www.indatech.eu

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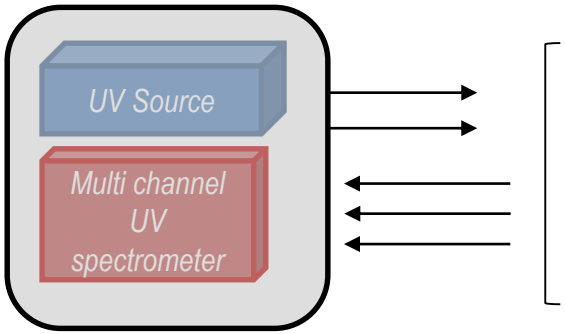
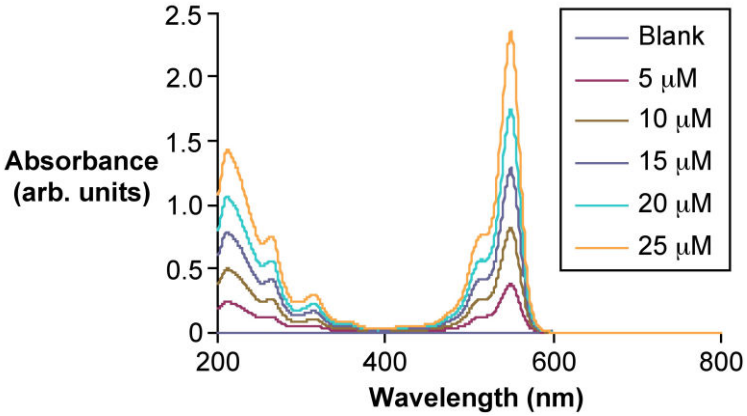
Technical background

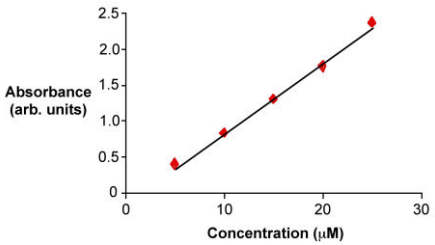
- A multi channel system perfect for liquid samples from clear to turbid







For each application the system can embed the required algorithm (e.g. PCA, PLS) to predict the parameters of your interest (e.g. concentration)



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Context and Objective

- The final objective will be the use of the UV-visible measuring device as part of the verification of the cleaning in place process

- For this first proof of concept, we will be looking at the sensitivity of Asuryan to several molecules used in the cleaning process
  - Acetone (objective of 15 ppm)
  - Isopropanol

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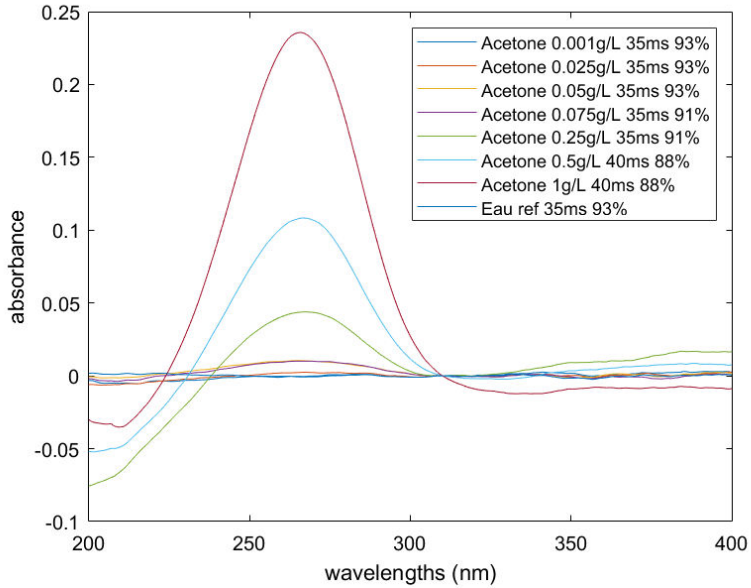
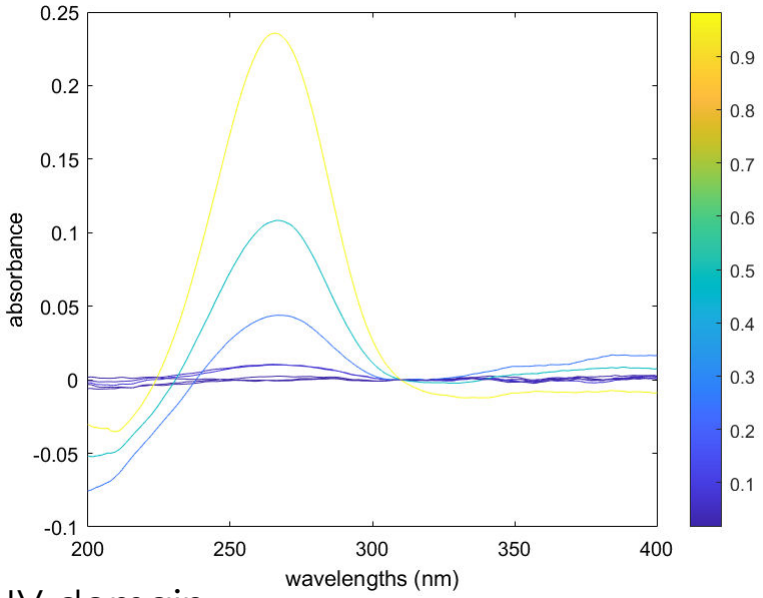
Results acetone

- Results for sensitivity of acetone of 10 mm transmission Asuryan setup

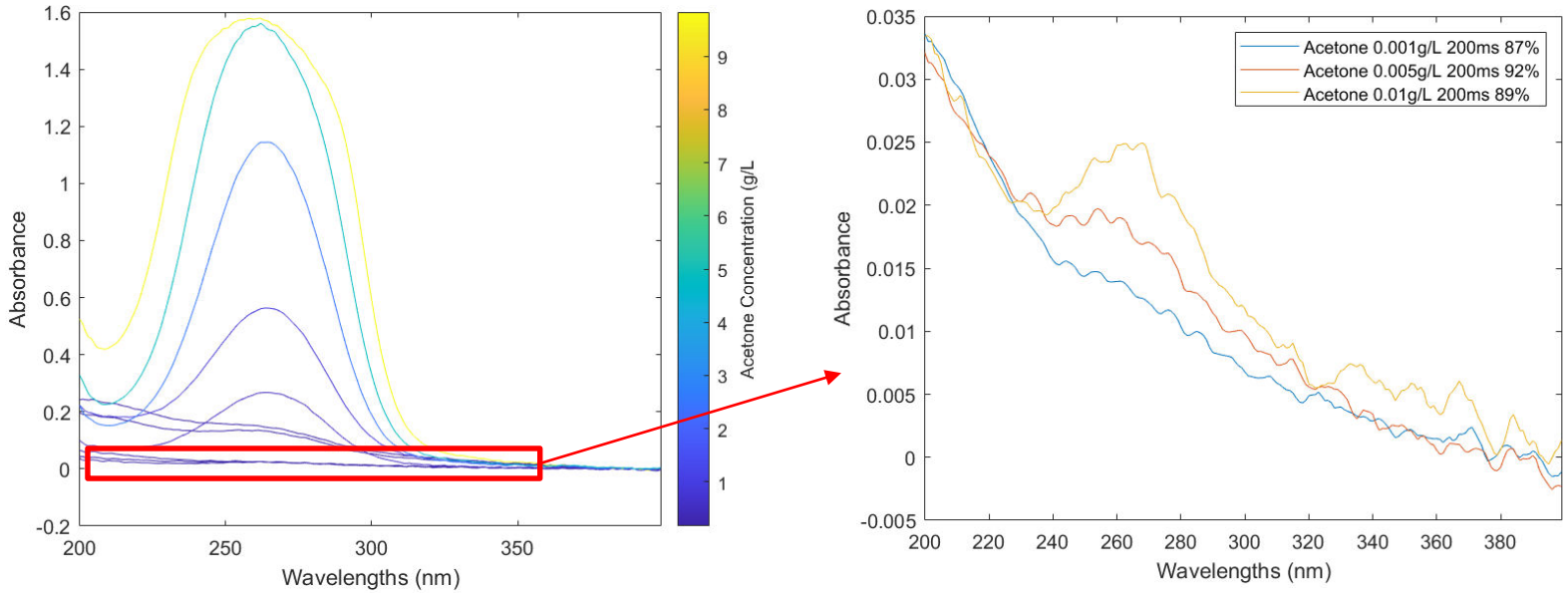




- Reactivity of acetone at 260 nm in the UV domain
- Very good sensitivity from 0.25 g/L (250 ppm)
- Difficult to detect acetone between 0.05 (50 ppm) and 0.075 g/L (75 ppm) but nevertheless reactivity at this level
- Absorbance at 260 nm difficult to consider significant for 0.025 g/l (25 ppm)
- A sensitivity of the device to acetone between **25 and 50 ppm**

Results acetone

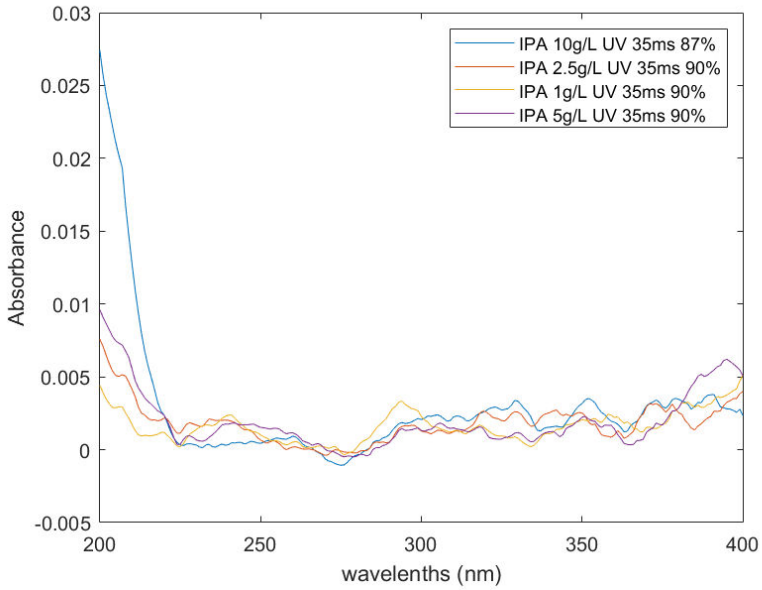
- Results for sensitivity of acetone of 20 mm transflexion Asuryan setup

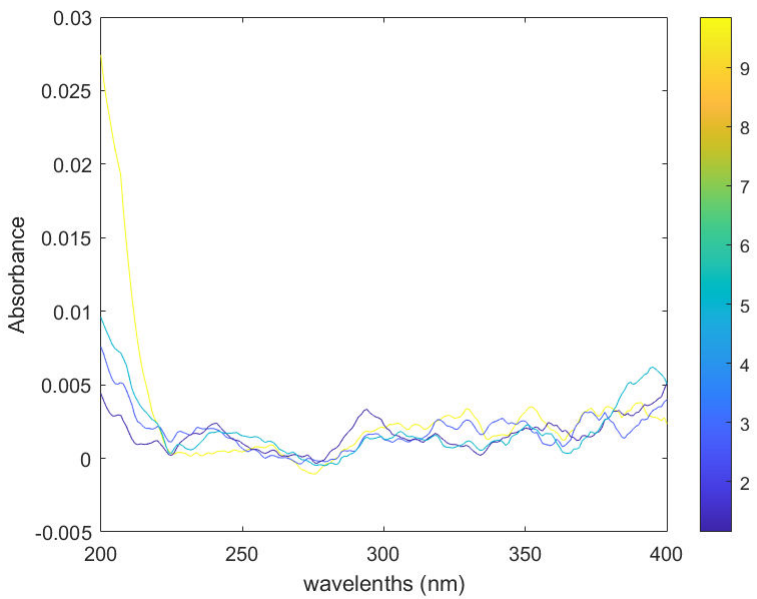


- Reactivity of acetone at 260 nm in the UV domain
- Very good sensitivity from 0.1 g/L (100 ppm)
- Need to zoom in on spectra with concentrations less than or equal to 0.1 g/L
  - Detector sensitivity at levels of 10 ppm
  - Sufficient sensitivity to distinguish differences of 5 ppm in absorbance spectra

Results isopropanol

- Results for sensitivity of isopropanol of 20 mm transflexion Asuryan setup





- Reactivity of isopropanol at 210 nm in the UV domain
- Much less sensitive to alcohol like isopropanol
- Detectability of the order of g/L (absorbance < 0.005)

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Conclusions

- Good sensitivity of Asuryan to acetone at 260-270 nm
  - Sensitivity depending on the optical path length used
  - A sensitivity of around 10 ppm using a 20 mm transflexion probe
  - Sensitivity of 25-50 ppm using a 10 mm cuvette in transmission
  - Sensitivity could be improved by increasing the optical path in transmission

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Part 2 : Acetone quantification

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Samples

- Pure acetone was diluted in pure water

Sample	Concentration (ppm)
S1	1.5
S2	4
S3	8
S4	15
S5	30
S6	60

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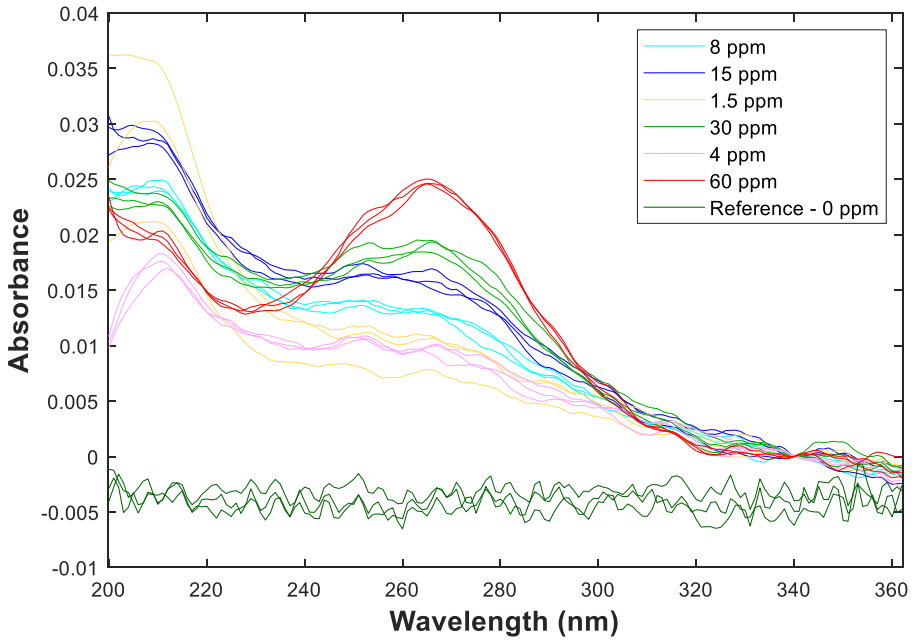
Results (1): Preprocessed spectra

- Integration time: 35 ms ; 20 scans
- Cuvette holder with 10 mm path length ; 3 Repetitions per concentration
- Spectral range (UV lamp only): 200-360 nm
- Pure water was used as reference
- Preprocessing: SG Smoothing (w=15, p=2) + Baseline correction (340 nm)



- Absorbance is well correlated to acetone concentration
- Samples bellow 5 ppm are mixed. Nevertheless, these low concentrations can still be detected and differentiated from the reference sample
- The limit of quantification (LOQ) can be set at 4 ppm and the limit of detection (LOD) at 1 ppm

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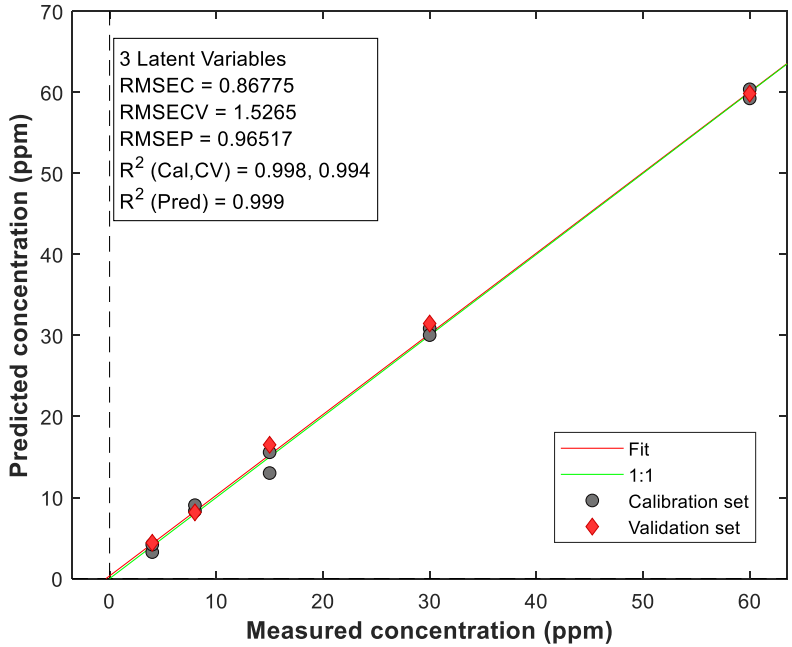
Results (2): PLS quantification model

- Calibration set = 9 samples (rep1, rep2) ; Validation set = 5 samples (rep3)
- Concentration range: 4-60 ppm



Prediction of the validation set

Y Measured 1	Y Predicted 1
8	8.1
15	16.5
30	31.4
4	4.4
60	59.8

- We obtain an accurate PLS model with an error of prediction RMSEP = 1 ppm

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Results (3): PLS quantification model

- Calibration set = 12 samples (rep1, rep2) ; Validation set = 6 samples (rep3)
- Concentration range: 1.5-60 ppm
- **Path length: 40 mm**

➢ We obtain an accurate PLS model with an error of prediction RMSEP =

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