WILSON ANALYTICAL

Oil and Gas Production

Extraction of:

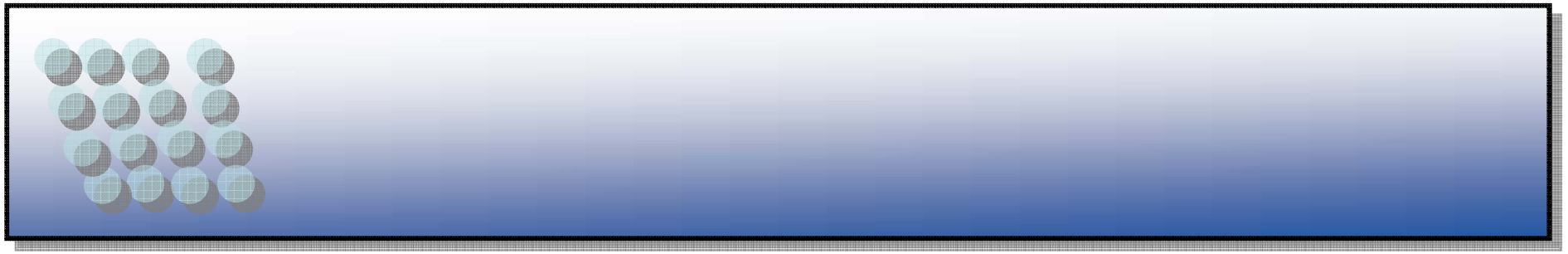
- oil
- mixed gases
- **water**

Corrosion

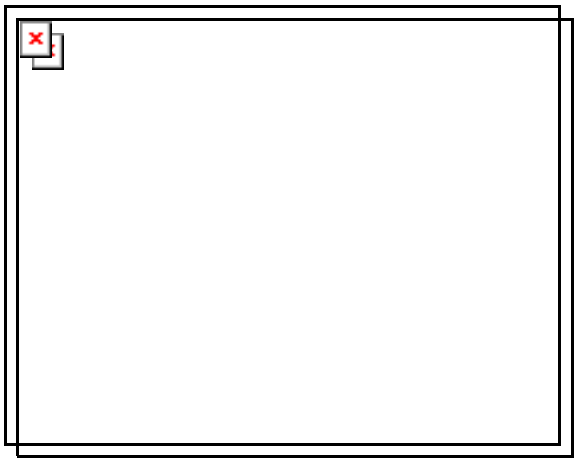
The water extracted in the process is often a brine (mainly NaCl), which may include other corrosive materials such as sulfides.

How can we control corrosion?

The primary method is the addition of corrosion inhibitors at the beginning that spontaneously adsorb on the surface of carbon-steel equipment.



How can we control corrosion?



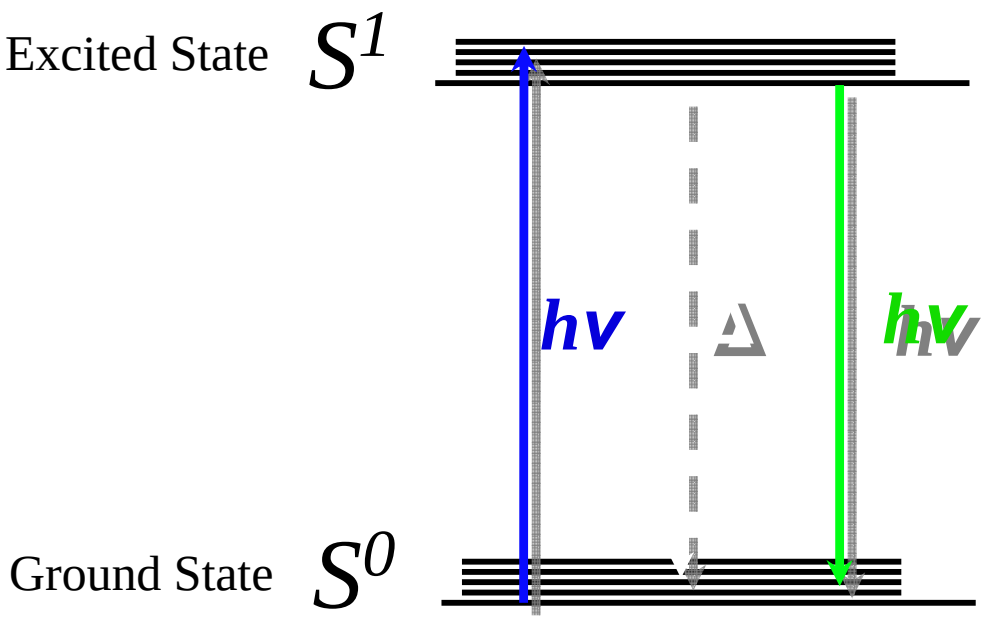
Commercial corrosion inhibitor packages contains active materials made of quaternized amines, called “quats” in the industry.

In order to insure that our corrosion protection is working, we need to quantify their concentration in the water extracted from oilfields.

WILSON ANALYTICAL

Fluorescence

Fluorescence is a property of certain molecules to re-emit light upon absorption of a specific frequency of light.

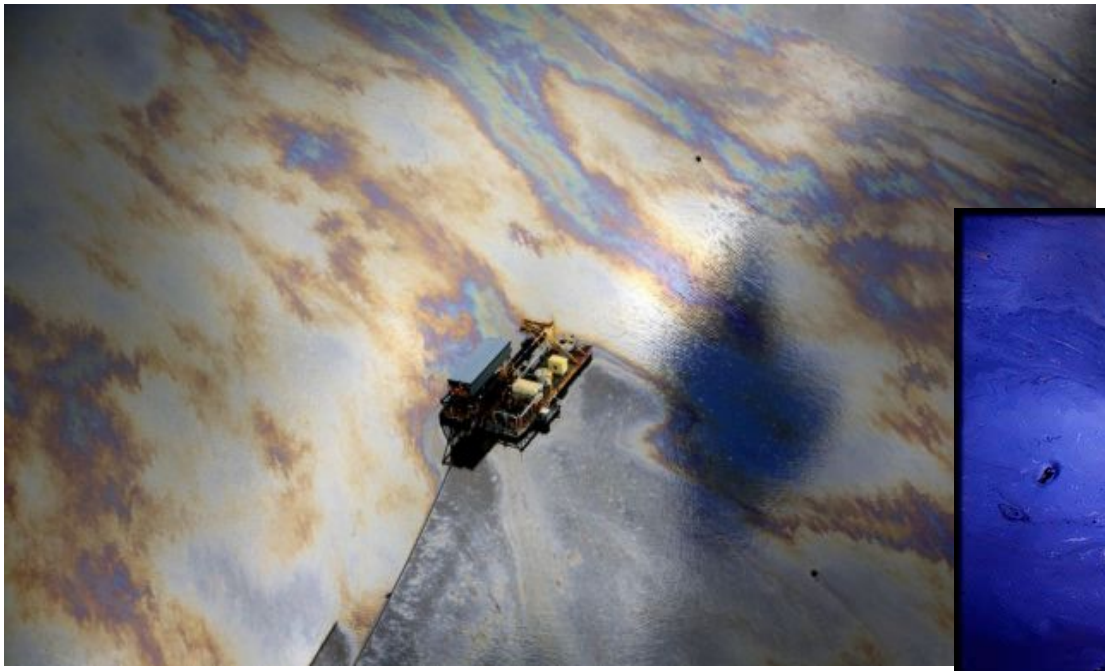


Parameters for Quats:

Excitation Max: 325 nm

Emission Max: 495 nm

What else can we use fluorescence for?



Tailings Ponds

Petroleum and its conjugated aromatic compounds (PAH's, NA's, TPH) in water

Oil Spills

D.L's are less than 1 ppm

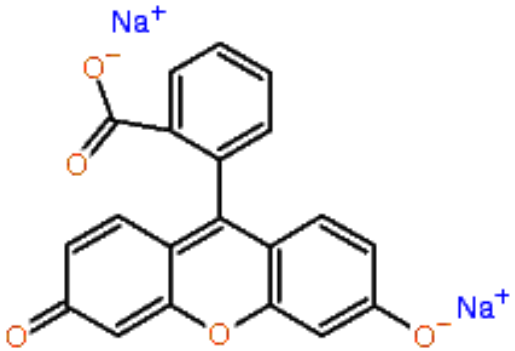
Field testing

What else can we use fluorescence for?

Water flow tracing using fluorescent dyes:

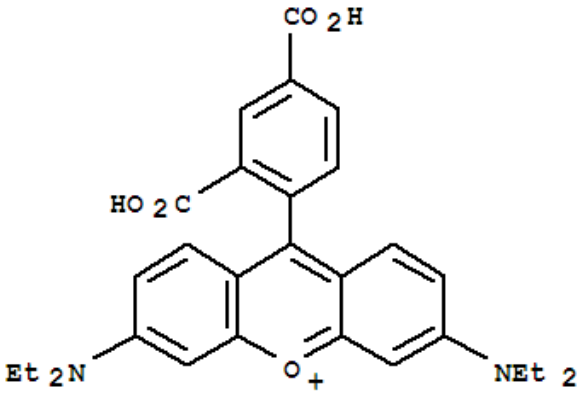
- Uranine (Green)
- Rhodamine WT (Red)
- Very low D.L's in water
- Typically less than 1 ppb

Water Tracing Dyes



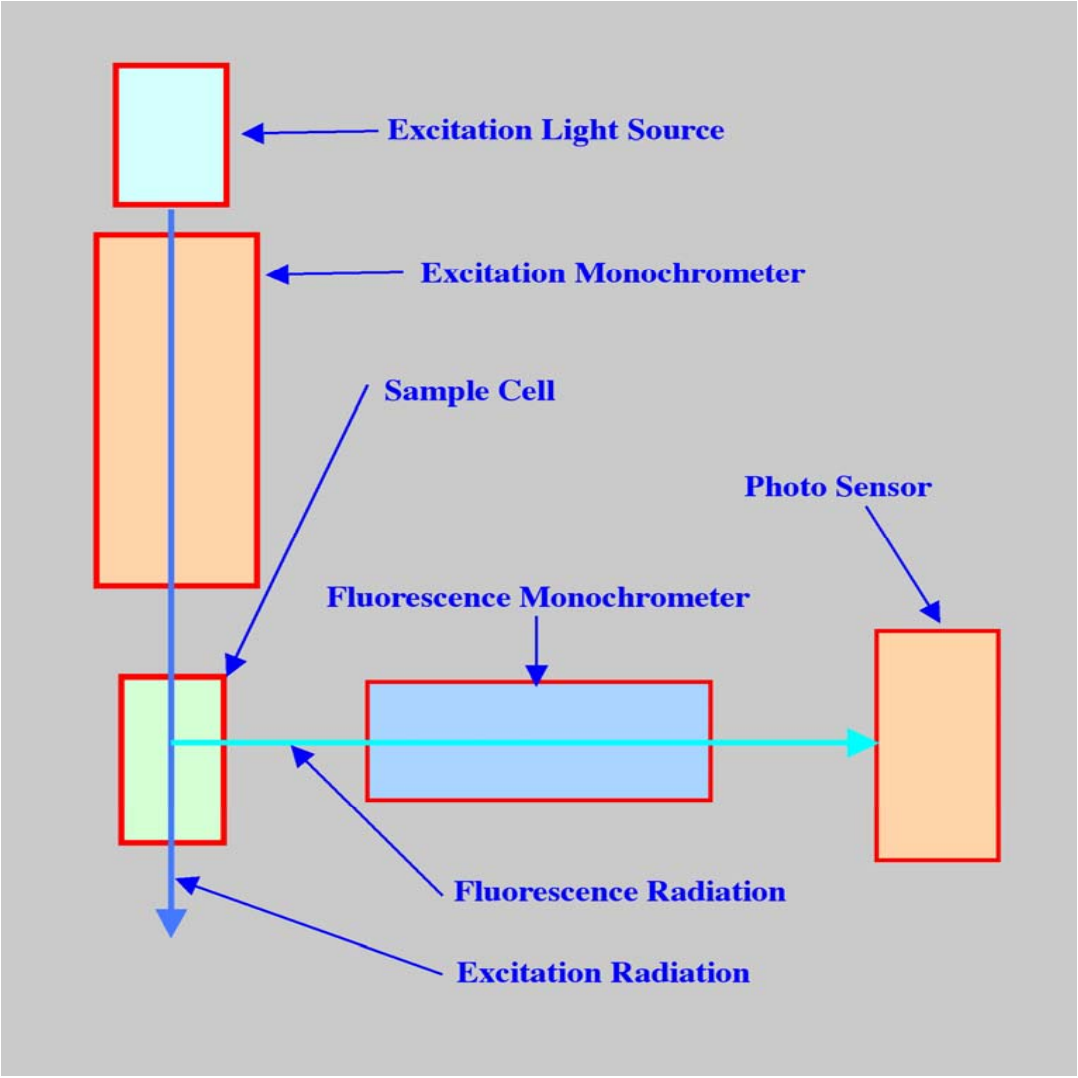
Uranine (Green)

Excitation Max: 491 nm
Emission Max: 516 nm



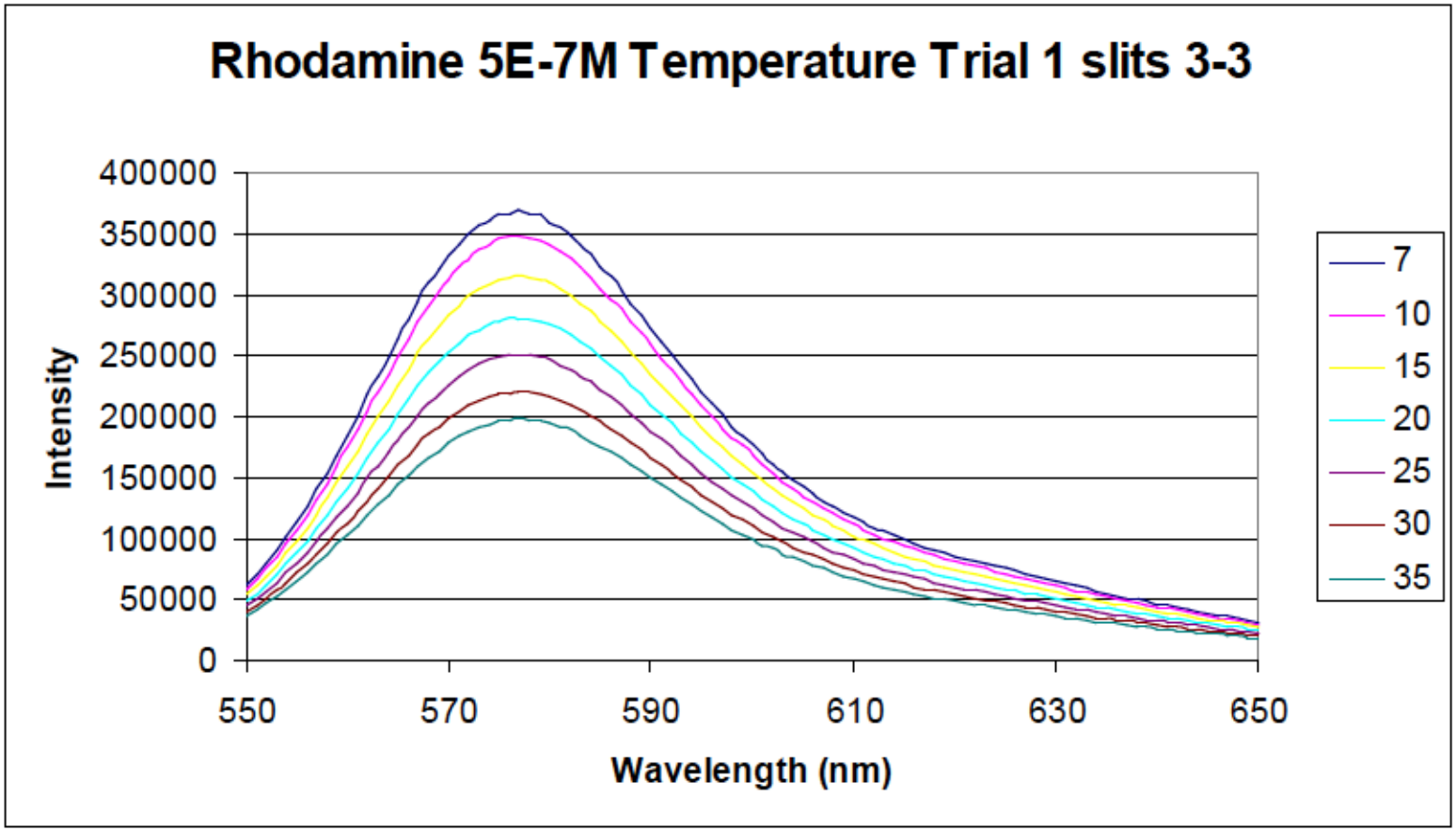
Rhodamine WT (Red)

Excitation Max: 555 nm
Emission Max: 580 nm



How can we build a field-based fluorescence analyzer?

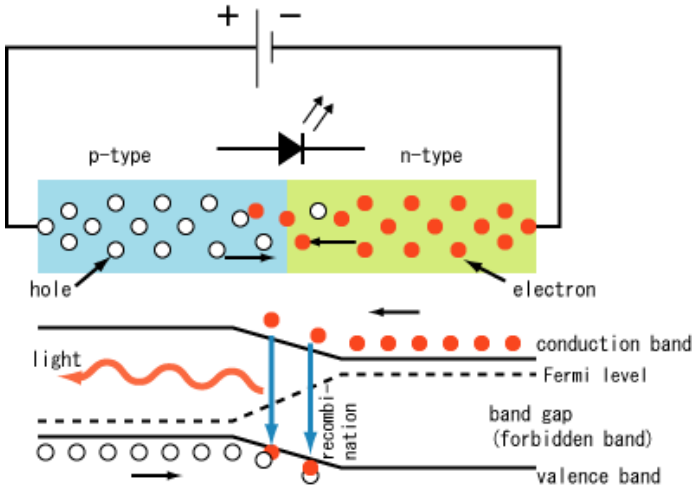
Temperature Regulation is Required



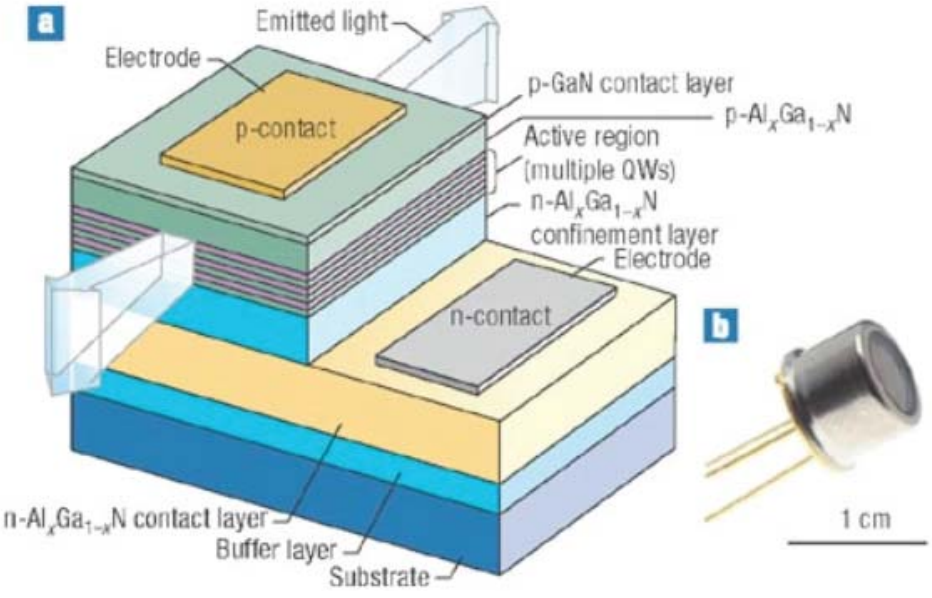
WILSON ANALYTICAL

Can
we just use
a lab-based
fluorescence
analyzer?

What about a bright, rugged uv or visible light source?

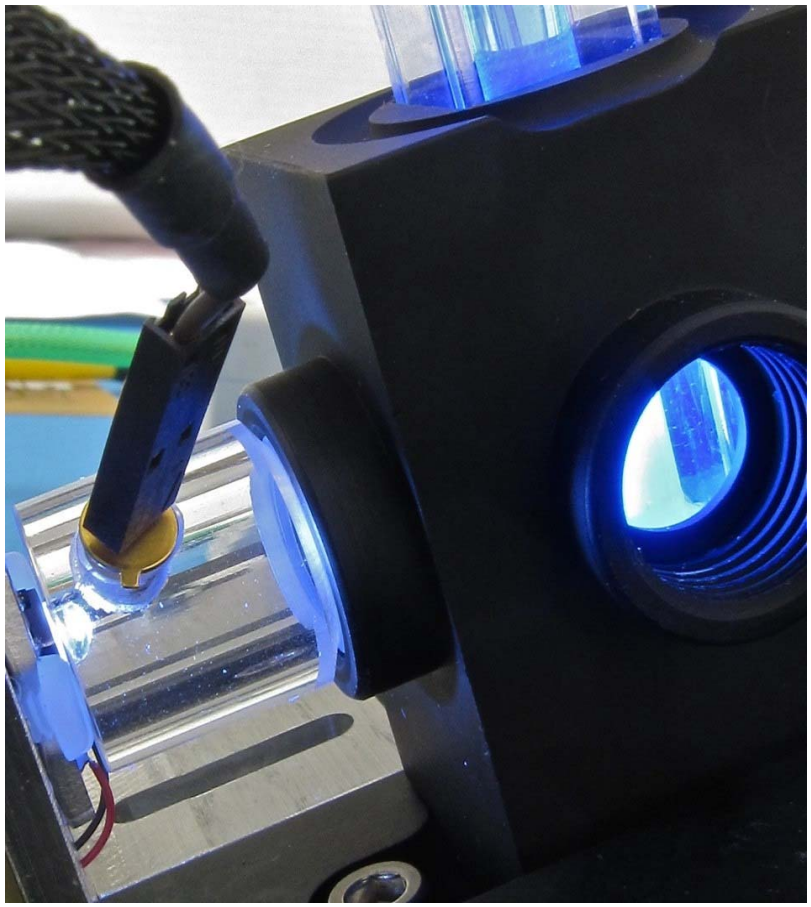


nano-based high-output uv-LED at 360 nm



How can ensure signal stability?

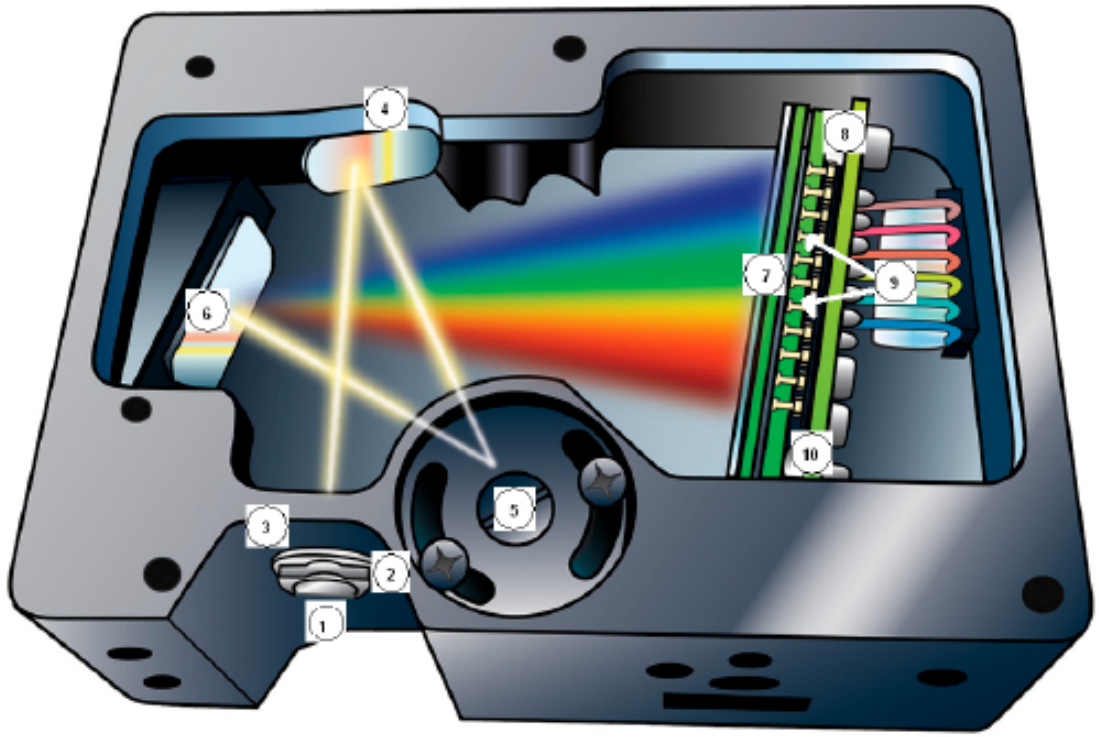
- Interchangeable excitation sources are required
- Optical-feedback based light source regulation
- Instrument and sample temperature regulation



WILSON ANALYTICAL

What about fluorescence signal discrimination and detection?

High-throughput,
USB-powered,
visible range,
micro-spectrometer



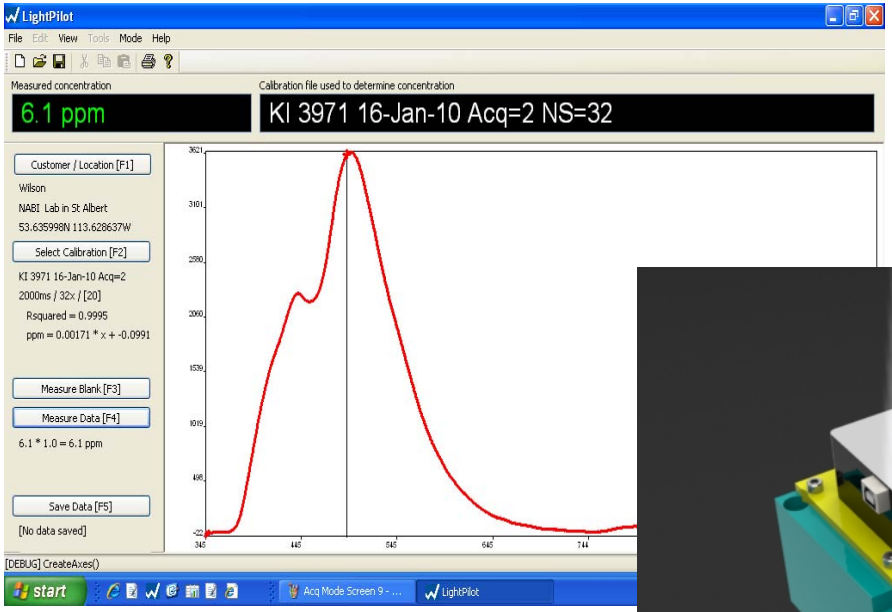
WILSON ANALYTICAL

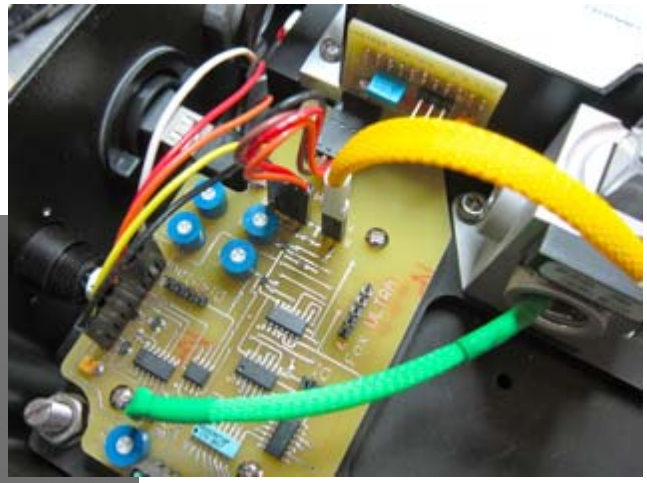
Design and Manufacture of Field-Based Instrumentation

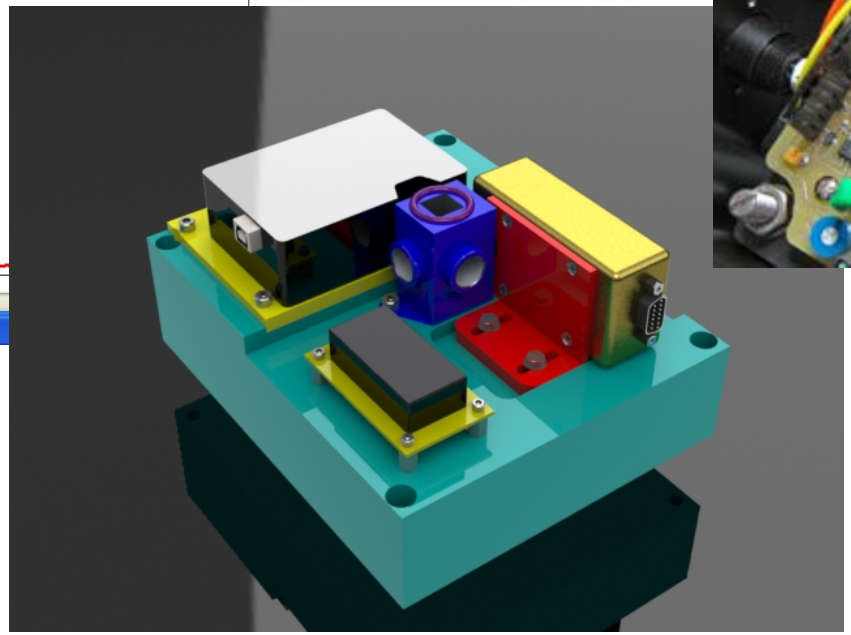
- First ruggedized unit to measure corrosion inhibitor residuals in oilfield waters.
- Based on fluorescence.
- Optical-feedback regulated excitation light sources at 360, 405, 460 or 525 nm.
- Full visible detection with complete spectrum.
- Temperature regulation to +/- 5 degrees C.
- Very field-hardened and user-friendly

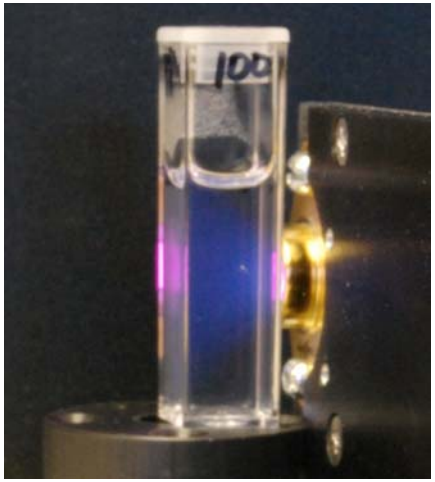
www.wilsonanalytical.com

WILSON ANALYTICAL









Custom Software, Machining, Optics and Electronics

www.wilsonanalytical.com

WILSON ANALYTICAL

Robust Field Operation

12 V operation and GPS location

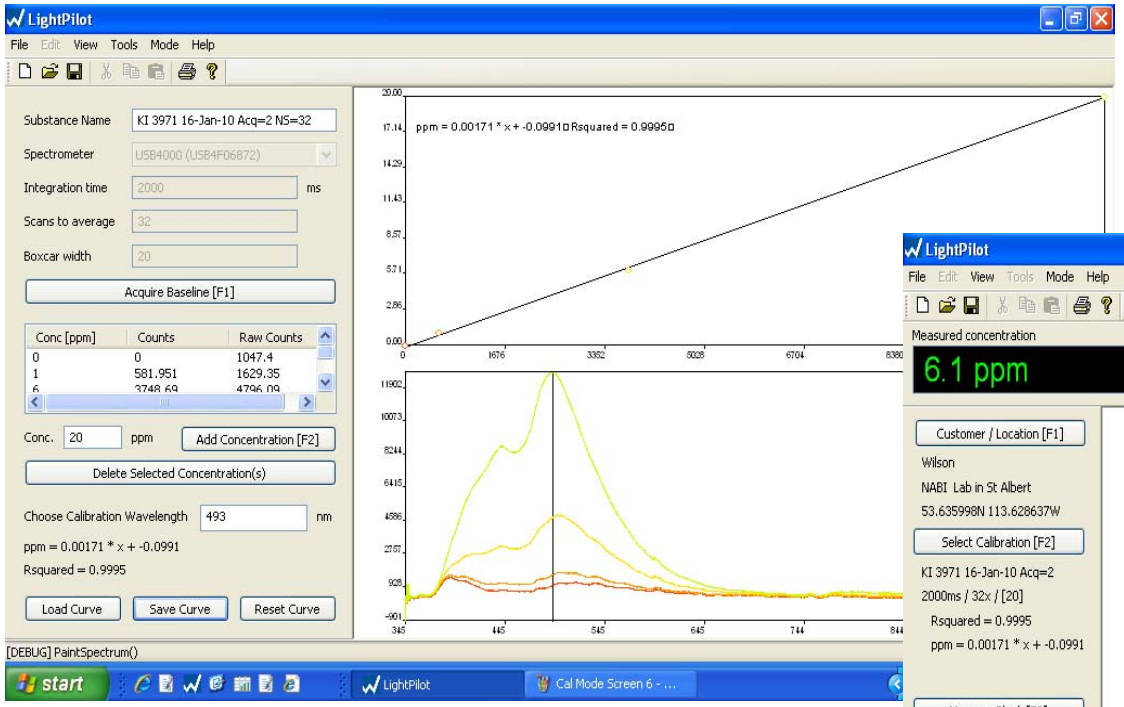
Disposable cuvettes and
SPE-based assays

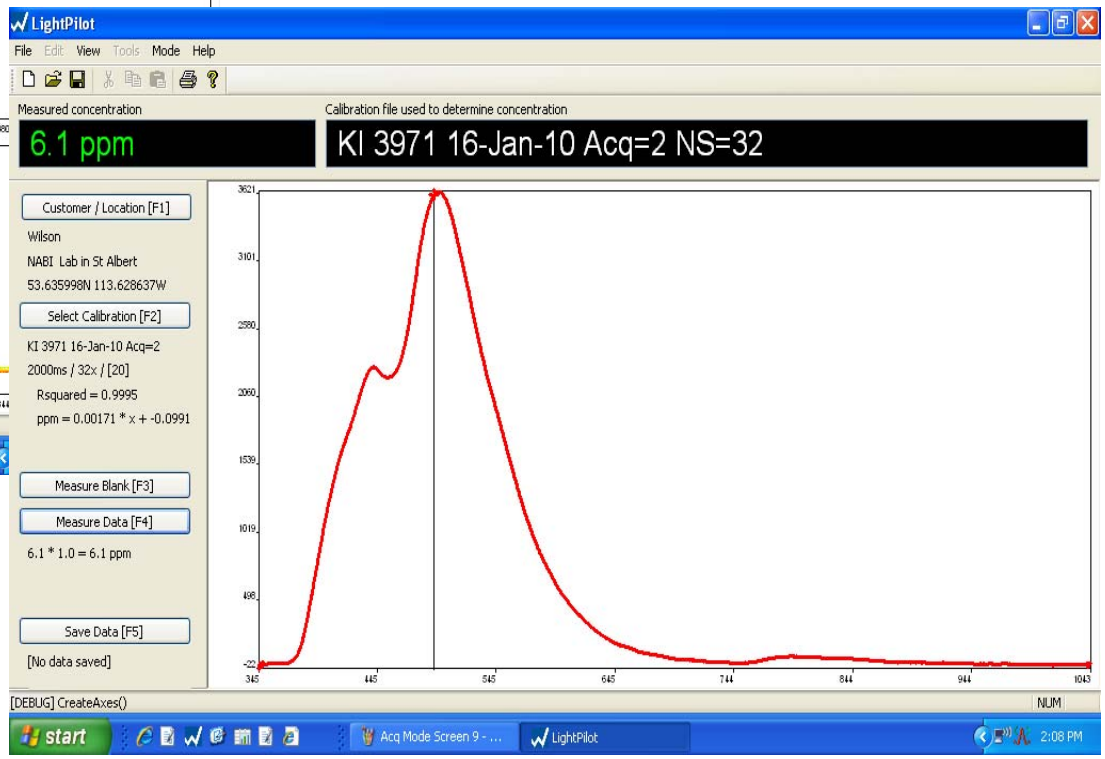
Field-ready QC samples

www.wilsonanalytical.com

WILSON ANALYTICAL

Custom Calibrations and Low Detections Limits in the Field

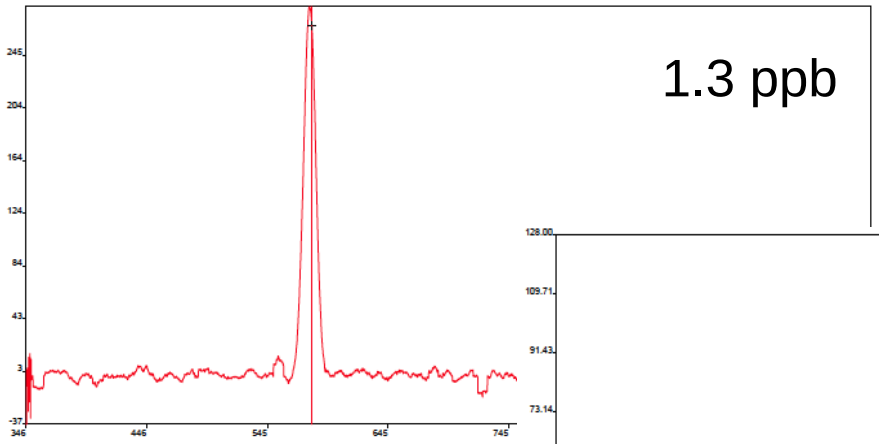


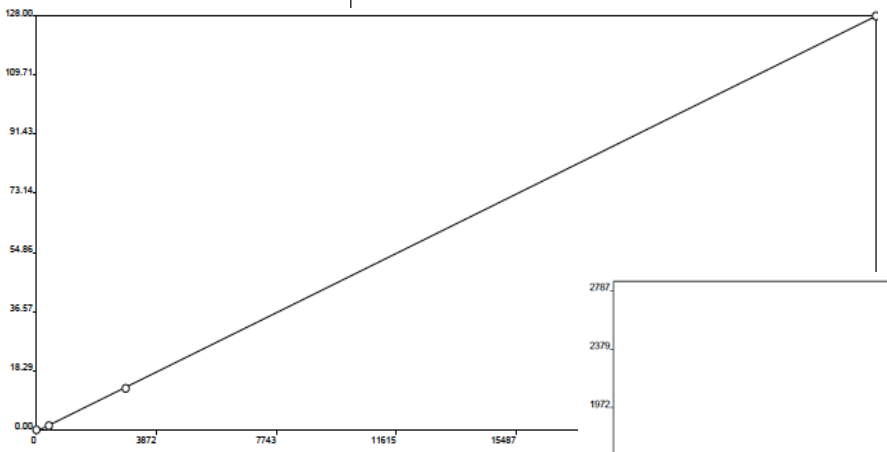


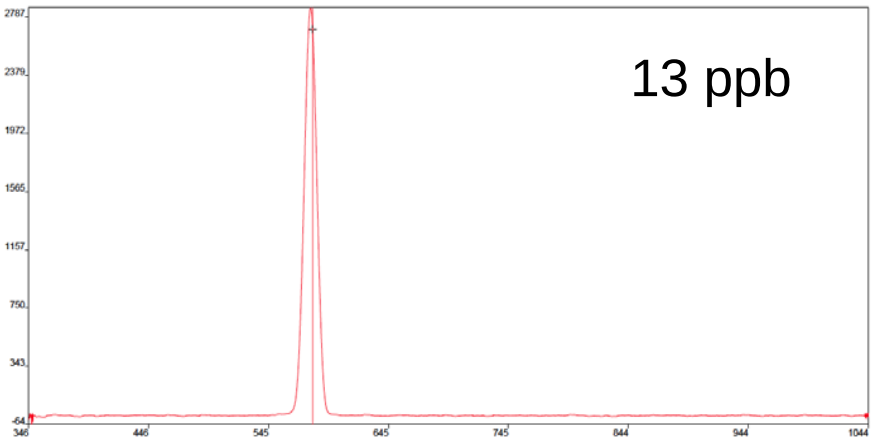
1 ppm detection limit for corrosion inhibitors

WILSON ANALYTICAL

Very Low Detections Limits in the Field for Fluorescent Dyes



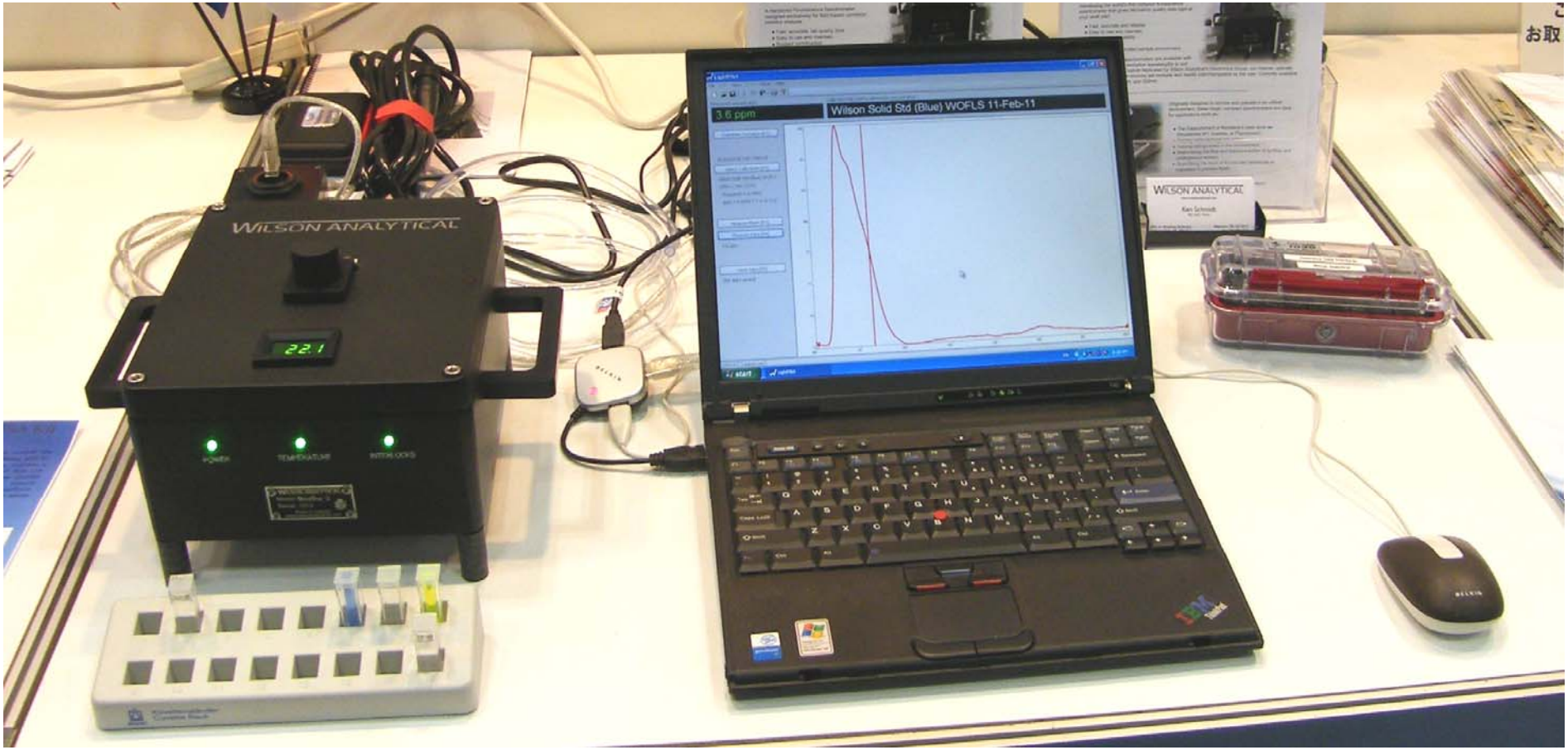




Less than 1 ppb detection limit for Rhodamine WT with 525 nm excitation

WILSON ANALYTICAL

Integrated System Design and Operation



The Future?

Enhanced water analysis in real time, directly in the field.

Instant data input to field-based software for real-time data modeling of dynamic processes