CoolSpeK UV/CD

Cryostat for Cuvette Spectroscopy

CoolSpeK UV USP-203/USP-203CD

- *For UV-VIS-IR, Fluorescence, CD and custom-made Spectrometers*
- *No vacuum pump needed!*
- *Designed for liquid samples!*
- *Great for kinetic study!*
- *From -80˚ (-180˚C conditional) to +100˚C!*
- *Light weight and compact footprint!*

WorldWide Exchange LLC

www.wwe-us.com

UNISOKU
TII Group
MUTUAL SATISFACTION

Why do you need CoolSpeK?

Temperature measurements are critical in many areas of spectroscopy. In absorption and photoluminescence experiments, lowering the temperature narrows the spectral bands thus improving spectral resolution, making it easier to identify and interpret electronic and vibrational transitions. CD spectra are usually more intense at lower temperatures due to higher rigidity of chiral macromolecules. Unlike in conventional cryostats, with the CoolSpeK, optical measurements including kinetic studies can be performed in a standard 10 x 10 mm absorption or fluorescence cuvette (adapter for 1 mm or 2 mm optical path cuvette also available). One can easily carry out quantitative measurements, such as low-temperature fluorescence quantum yield and absorbance as well as thermodynamic parameters of chemical reactions over a broad temperature range. Since the CoolSpek also allows heating samples up to 100°C, it is a great tool for temperature study of biological systems, such as stability of proteins, melting curves of DNA and phase transitions in biomemebranes with a variety of optical techniques.

The CoolSpek cryostat, manufactured by UNISOKU Co., Ltd. – a world leader in cryogenics, is an invaluable addition to any spectrometer as it brings a new dimension to spectroscopic experiments.

CoolSpek is light weight and compact, can be placed inside most commercially available spectroscopy instruments:

- Unisoku RSP-1000/TSP-1000
- Agilent 8453/8454
- CARY 50/60
- CARY 5000/6000
- Beckman DU-7400
- JASCO V-550/560/570/650/660/670/770
- JASCO FP-6200/6500/6600/8000
- JASCO J-720/820
- Hewlett-Packard HP8453
- HITACHI U-2800/2900/3500/4100
- HITACHI F-4500/7000
- Horiba FluoroMax
- Horiba FluoroCube
- Perkin Elmer Lambda Series
- PTI QuantaMaster/TimeMaster/PicoMaster
- SHIMADZU UV1800/2000/3000 Series
- SHIMADZU UV2400/2450/2550
- SHIMADZU RF-5300
- Scinco S-3100
- Evolution 300
- Custom-made spectroscopy setups

*The lid of sample compartments in some spectrometer may not close when the cryostat is attached.
*Please contact us if your spectrometer is not listed above.

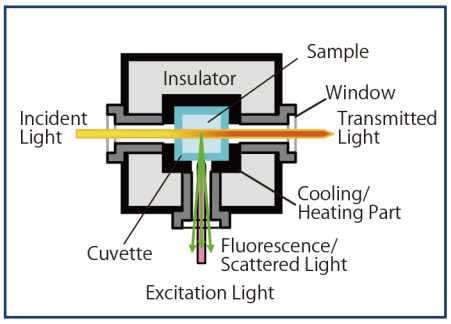
CoolSpeK allows you to obtain spectra and chemical kinetic rates under low-temperature conditions easily.

CoolSpeK is attached to a sample compartment of commercial UV-Vis or fluorescence spectrometers using an adapter.

Key Features

- **Optics: 180°** for transmittance (absorbance), **90°** for fluorescence
- **Designed for liquid samples:**
  Uses standard 10 x 10 mm cuvette—just insert the cuvette and take the measurement. **NO VACUUM required!**
- **Great for Kinetic Studies:**
  Reagent can be injected and mixed by the optional magnetic stirrer, allows easy kinetic measurements.
- **Small volume sample capability:**
  Special adapters for 2 mm and/or 1 mm optical path cuvettes available
- **Solid and powder sample capabilities:**
  Sample holders for transmittance and fluorescence measurements available
- **Low dew condensation due to special mechanical design and heating function:**
  Less than 0.05OD/hour at -80°C (purging sample compartment with dry gas recommended at lower temperatures)
- Precise temperature control by auto-regulated gravity flow of liquid nitrogen

Example of use

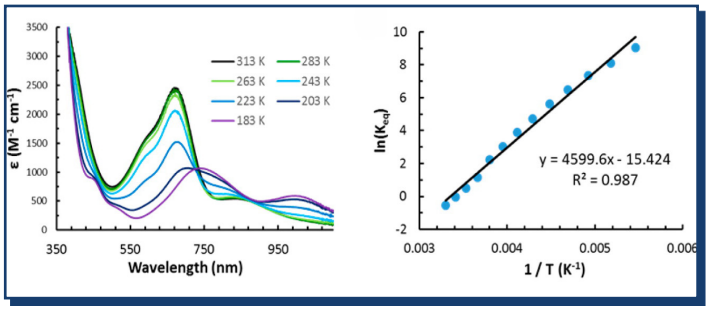


Applications

- Thermodynamics of chemical reactions
- Luminescence quantum yields in low temperature glasses
- Temperature effect on inclusion complexes of cyclodextrins with organic compounds
- Coordination chemistry at TiO_2 surface
- Thermal degradation and structural transitions of coordination polymers
- Phase transition of water trapped in reversed micelles
- Mechanism of biological nitrogen binding and reduction
- Metal-catalyzed redox reactions
- Photolysis at low temperature
- Chemical oxidation
- CD spectra of chiral molecules
- Phosphorescence
- Protein stability
- Nucleic acid melting
- Self-assembly of nucleotides under super-cooled conditions
- Temperature effect on MLCT excited state relaxation pathways
- Photophysical behavior of MLCT photosensitizers
- Temperature effect on transient absorption of MLCT complexes
- et al

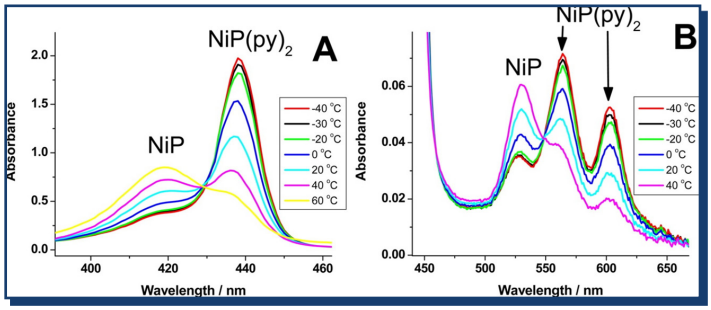
Application Examples

Absorption spectra - N2 binding



Absorption spectra of N2 binding iron hydrite ligands as a function of temperature in N2 saturated hexane solution and the derived Van't Hoff plot at 675 nm. *(J. Rittle et al., J. Am. Chem. Soc. 2014, 136, 13853–13862).*

Absorption spectra – Ligand coordination



Absorption spectra of Ni-porphyrin in pyridine illustrating ligand binding at different temperatures. (A) Soret band region with λ_{max} = 419 nm assigned to NiP and λ_{max} = 438 nm assigned to $NiP(py)_2$ and (B) Q-band region with λ_{max} = 531 nm for NiP and λ_{max} = 564 and 603 nm for $NiP(py)_2$. *(D. Achey et al., Inorg. Chem. 2013, 52, 9574–9582)*

Accessories

Magnetic Stirrer (time of order option)

Built in at the bottom of CoolSpeK main body.
The spin speed is controlled by the controller. *(Not available in some models of spectrometers.)*

Standard Cuvette

Four side transparent quartz cuvette with a screw cap (light path length: 10mm)

Adapter for 1 mm or 2 mm Light Path Length Cuvette Absorption

This adapter fills the gap between the cuvette and the cryostat's internal body
A spring in the adapter allows better thermal conduction.*

*Does not include cuvette
** Please contact us if your sample dimension differs from above.

Adapter for 1mm Light Path Length Cuvette Fluorescence

This adapter allows surface fluorescence measurements of samples with high absorption in 1mm light path length cuvette.*

Solid/Powder Sample Holder for Transmittance

Suitable sample: solid sheet or powder
Suitable dimension: φ10mm or 10mm x 10mm,
Thickness: 0 ~ 3.2mm or 0.7 ~ 4.2mm**

Solid/Powder Sample Holder for Fluorescence

Suitable sample: solid sheet or powder
Suitable dimension: φ13mm x 13mm,
Thickness: 0 ~ 3.2mm or 0.7 ~ 4.2mm**

Specifications

Liquid Nitrogen Container	Stainless steel dewar, 2L
Low-Temperature Sample Chamber	Aluminum, polyurethane foam for thermal insulation
Optical Windows	Quartz, 3-way (absorption and fluorescence)
Suitable Cuvette	Outer dimension of 12.5 mm × 12.5 mm For 1 mm and 2 mm optical path cuvettes use with adapter
Temperature Control	Regulated liquid N2 flow controlled by automatic valve
Temperature Range	-80°C ~ +100°C (-180°C conditional, below -80°C dry gas purge is recommended)
Temperature Accuracy	±1°C or ±0.5% of set temperature, whichever is larger. (error of sensor not included)
Quantity of Dew Condensation	Less than 0.1 OD/hour at -80°C with Unisoku Spectrophotometer
Temperature Sensor	Resistance thermometer sensor (Pt-100 Class B)
Functions	Two built-in heaters: one to prevent dew condensation on optical windows, another for temperature control
Cryogen Used	Liquid nitrogen
Liquid N_2 Consumption Rate	1L/ Hour
System Electronics	AC 100-120V, 1A 50/60 Hz
External Size	146.5 (H) × 90 (W) × 111 (D) mm

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