

BI-4500 series

With analysis modules, autosampler and auto buffer exchange option



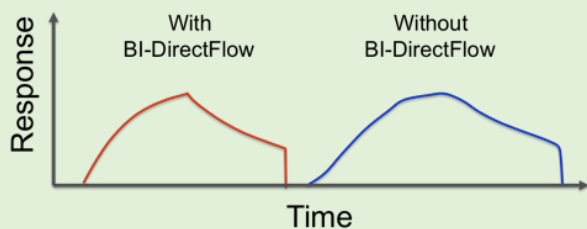
- ✧ *High throughput with 5-channels and fully automated sampling*
- ✧ *Precise sample delivery with BI-DirectFlow™ technology*
- ✧ *High sensitivity to measuring small molecules*
- ✧ *Innovative multi-module design for optimal flexibility*
- ✧ *Cost-effective solution*

The new BI-4500 SPR system provides multiple channel flow modes and delivers high-quality binding response for low immobilization and small molecule (<100 Da) detection. Equipped with BI-DirectFlow™ technology, the BI-4500 system integrates precision sample delivery with near-zero dispersion for fast kinetics and effective removal of various secondary effects. Its modular innovative design gives users optimal flexibility to choose amongst various analysis modules for life science, electrochemistry, and sensing in liquid and gas phase SPR applications.

Precise sample delivery with BI-DirectFlow™

BI-DirectFlow™ technology delivers samples to the sensor surface with near-zero dispersion, generating high-quality data that more clearly distinguish true binding events from secondary effects.

Effect of Dispersion

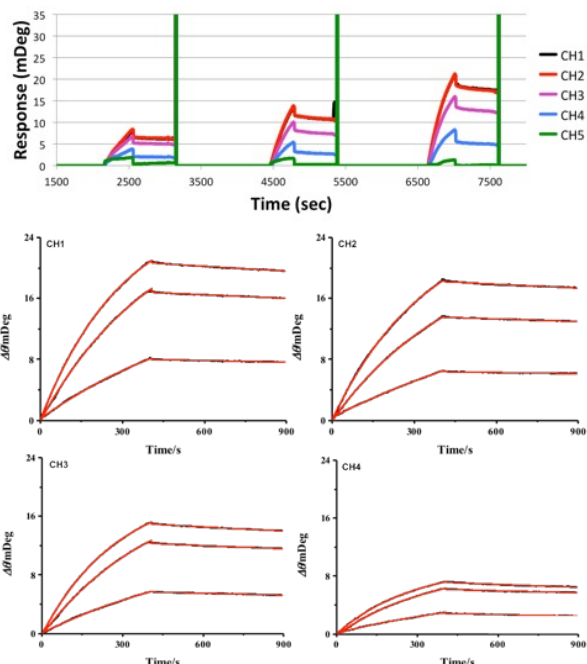


The binding response on the left (without dispersion) has very sharp, well-defined binding analysis regions and generates more accurate and reproducible results. The binding response on the right (with dispersion) has blurred, poorly defined binding analysis regions.

Life Science Applications

Binding Kinetics Analysis

Interaction between Bovine Serum Albumin (BSA) and Anti-BSA can be monitored in real-time by using the flow injection SPR analysis module.

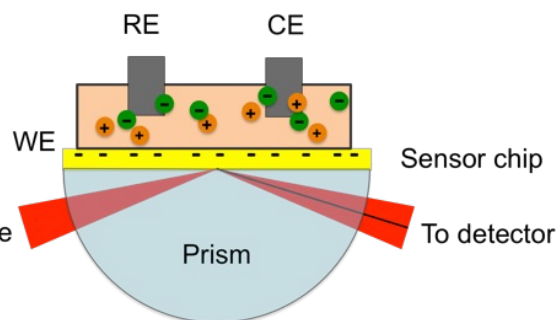
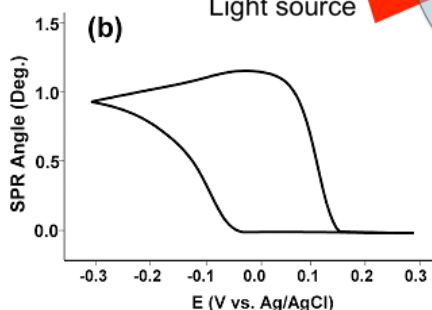
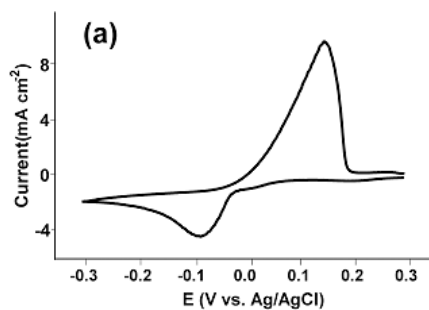


Reference subtracted binding curves of four channels at varying analyte concentrations with kinetic analysis fits showing an associate rate constant $k_a = 8.6 \times 10^4 \pm 0.5 \text{ M}^{-1}\text{s}^{-1}$, a dissociate rate constant $k_d = 1.5 \times 10^{-4} \text{ s}^{-1} \pm 0.25$, and affinity binding constant $K_D = 1.7 \text{ nM} \pm 0.2$

Material Science Applications

Metal Deposition/Stripping in EC SPR

Using EC SPR to quantify the amount of metal electrodeposited onto a surface, the thicknesses of the copper film can be determined with sub-angstrom precision. EC SPR's ability to determine tiny thickness variations down to the sub-angstrom level demonstrates its superb sensitivity.



EC SPR study of 5 mM $\text{CuSO}_4/0.1 \text{ M H}_2\text{SO}_4$ solution: (a) cyclic voltammogram showing copper redox peaks (b) simultaneous SPR response confirming copper film deposition and stripping corresponding to the redox potentials.

BI-4500 System Specifications:

| | | |
|----------------------|--|---|
| Base Station | Light source | Two low coherent light sources (670 nm) |
| | Detection speed | 4 ms |
| | Incident angles | 40-47 Deg (gas) 67-81 Deg (liquid) |
| | Refractive index ranges | 1.00 - 1.40 |
| | Baseline noise | < 0.06 RU RMS (0.01 mDeg RMS) |
| | Baseline drift | 0.30 RU/hr (0.05 mDeg/hr) (when ambient drifts < 1°C/hr) |
| | Measurement ranges | Association rate k_a : up to $10^8 \text{ M}^{-1}\text{s}^{-1}$ Dissociation rate k_d : 10^{-6} to 1 s^{-1} KD: 1pM to 1mM Active Concentration: 1pM to 1mM |
| | Molecular weight cutoff | 100 Da |
| | Temperature Control | Control accuracy at 0.01 °C Range: 50°C to 10°C below ambient temperature max down to 6°C |
| | PC interface | USB 3.0 |
| | Data IO port | IO ports for sending and receiving raw signals with other equipment. |
| | Outer dimension and weight | 355(w) x 250 (h) x 515 (d) mm and 11.5 kg |
| | Power supply | 110-230 V 50/60 Hz |
| Fluid Handling | Sample channels | 5 channels |
| | Flow cell material | PEEK (biologically compatible) |
| | Flow rate | 1.0 to 150 $\mu\text{L}/\text{min}$ (application dependent) |
| | Buffer handling | Dual syringes driven by programable infusion pump Providing >8 hours of continuing operation. |
| | Sample injection volume | 10 to 500 μL (application dependent) |
| | Sample injection methods | Semi automated (BI-4500) Fully automated (BI-4500A) |
| | Channel volume | < 32 nL |
| | Injection rise time | < 0.2 s |
| | Analysis module (standard) | 5-channel BI-DirectFlow™ Module |
| | Optional modules | EC-SPR module for SPR measurement with electrochemistry EC-DualFlow™ for two channel flowthrough EC-SPR measurement Gas SPR module for chemical vapor SPR measurement |
| Control System | Computer Software | Windows OS; SPR Control software for real-time instrument control with programmable interaction assays for various application protocols; Data Analysis software for affinity, kinetics analysis, and concentration determination (calibrated or calibration-free). |
| | Compliance | CE compliance; 21 CFR part 11 compliance; IQOQ certification |
| Optional Accessories | BI-Autosampler PP100 (standard with BI-4500A) | Automatic sample loading up to 768 compounds with programmable sample mixing and dilution. Sample capacity: two SBS microtiter plates or two 48 (1.5mL) Vials trays or two 12 (10mL) Vials trays |
| | BI-auto-buffer exchange pump (standard with BI-4500AP) | Six ports auto buffer exchange pump with inline degasser extending continuing unattended operation >120 hours. |

BI-4500 Analysis Modules:



BI-DirectFlow™

Included



EC-SPR

Optional



EC-DualFlow™

Optional



Gas-SPR

Optional

Analysis Modules:

BI-DirectFlow™ Analysis Module

This module enables precise flow control technology that delivers samples to the sensor surface with near-zero dispersion, enabling the study of SPR events in greater detail than ever before.

EC-SPR Analysis Module

This module facilitates simultaneous electrochemical and SPR measurements on the same sensor surface and is ideal for studying various electrochemical processes with SPR and for controlling surface binding and molecular conformational changes via electrochemical control.

EC-DualFlow™ Analysis Module

This module provides users with novel capabilities to study molecular binding processes and conformational changes of biomolecules under the influence of applied electrochemical potentials at different flow rates. Its small channel volume facilitates rapid sample exchange and fast kinetic studies, and also drastically reduces consumption of valuable biological samples.

Gas-SPR Analysis Module

This module enables the high sensitivity of SPR analysis to be performed in the gas phase, permitting new capabilities for sensor development, thin film analysis, environmental and air quality research, and gas molecule binding studies.

Sensor Chips:

Bare Gold Sensor Chip

Highly uniform gold film for reproducible SPR research.

Divided Gold Sensor Chip

Pre-patterned gold surface for SPR with EC-DualFlow™ applications.

CM Dextran Sensor Chip

Sensor with COOH- linker groups in a dextran hydrogel, ideal for high capacity amine coupling with low non-specific absorption.

Streptavidin (SA) Sensor Chip

Sensor with streptavidin in a dextran hydrogel for immobilization of biotinylated molecules such as proteins, peptides, nucleic acids or carbohydrates.

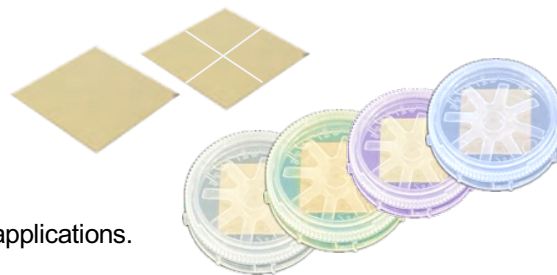
Ni-NTA Sensor Chip

Sensor with NTA used for immobilizing histidine-tagged molecules. NTA surface can be regenerated by injecting EDTA or imidazole.

Protein A Sensor Chip

Sensor with protein A immobilized on carboxymethylated dextran substrate pre-functionalized for affinity capture of a broad range immunoglobulins like total IgG, IgG1, IgG2 and IgG4 from Human, Horse, Rabbit, Goat, Sheep and Mouse.

Other types of sensor chips are available upon request.



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