



(SPS-R2R series)

Sputter System

SPS-R2R series

ULTECH Co., Ltd.

Introduction

(SPS-R2R series)

System Picture (reference)



Process

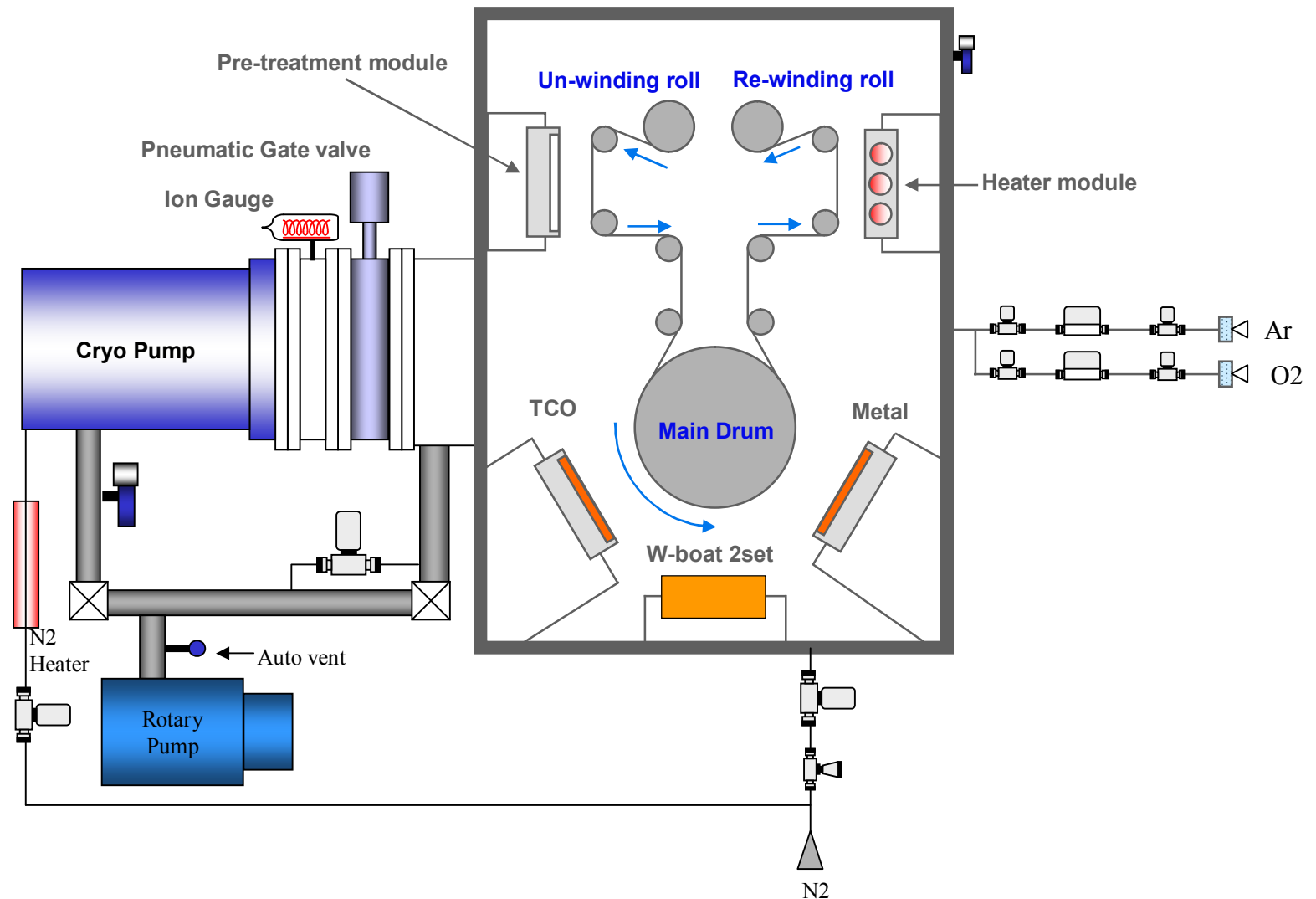
- 1) Application :
- 2) Sputtering material : TCO (ITO,AZO,ZnO), Metal
- 3) Film width : max. 100mm
- 4) Film length : max. 100M
- 4) Film speed : 0.1 ~ 10 m/min

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Introduction

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System Schematic



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Configuration

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- Substrate material : PET film
- Film width & load capacity : max. 100mm width film – 100m/roll
- Pre-treatment gun : Rectangular type – 1set
- Sputter gun : Rectangular type - 2set
- RF power supply : 600W – 1 set (for pre-treatment)
- RF power supply : 1KW – 1 set (for TCO sputtering)
- Pulsed DC power supply : 5KW – 1 set (for Metal)
- W boat 2ea
- P/S(5V/300A) 1ea + Select switch(2ch.)
- Thickness controller + Sensor 1ea
- Rotary pump (oil type) + Cryo pump
- Front access door open/close type
- Pre-heating heater temperature : max. 200℃
- Automatically control by PC

Specifications

(SPS-R2R series)

Process Chamber Module

- Process chamber
 - Front door type Electro-polished SUS chamber
 - Deposition shield plate
- Roll unit
 - Film width : max. 100mm
 - Film speed : 0.1 ~ 10 m/min
- Heating unit
 - Heater type : Lamp heater type
 - Max temperature : 200℃ (heater temperature)
- Sputter gun
 - Rectangular type sputter gun
 - Number of gun : 2ea
 - Target size : 200mm X 125mm X 6T
 - Target fixing : Metal bonding on backing plate



< Chamber inside view >



< Heating unit view >

Specifications

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Power Supply Module

- RF power unit
 - Quantity : 1KW – 1set (for TCO sputtering)
600KW - 1set (for pre-treatment)
 - Frequency : 13.56MHz
 - Operation type : Automatic type
 - RF cable kit
- Pulsed DC power supply (for metal sputtering)
 - Quantity : 5KW – 1set
 - Stability : Plasma compatible
 - Digital voltage/ampere meter



< RF power supply >



< Pulsed DC power supply >

Specifications

(SPS-R2R series)

Thermal Source Module

- Thermal power supply (1set)
 - Maximum power : 2kW
 - Output voltage : 0 ~ 5V
 - Output current : 0 ~ 300A
 - Current regulation : $\pm 2\%$ of full scale
- Thermal boat
 - 2 tungsten boat and spirals filaments
 - Separately pneumatically controlled Shutter for thermal boat
 - High current isolation feedthrough
 - Thermal evaporation source auto feeding system



< Thermal power supply >



< Thermal boat view >

Specifications

(SPS-R2R series)

Thickness Control Module

- Thickness controller
 - 0.0013 Å Thickness Resolution
 - 0.133 Å/sec. Rate Resolution
 - Fundamental frequency : 6 MHz
- Oscillator package
- Thickness sensor
 - Standard sensor
 - Water feedthrough : 2.75"CF flange



< Thickness sensor >

Specifications

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Vacuum Module

- Vacuum pump
 - Cryo pump : 4,000 L/sec @H₂O (1set)
 - Rotary pump : 1,600 L/min (1set)
 - Ultimate pressure : 7×10^{-7} Torr
- Pressure gauge
 - High vacuum gauge : Hot cathode ion gauge
 - Low vacuum gauge : Convectron gauge
 - Pressure readout & cable kit
- Pressure control
 - APC (Automatic Pressure Controller) – 1set
 - Electrical Throttle valve – 1ea
 - Baratron gauge : Full scale 1Torr – 1ea
- Vacuum valves & lines
 - Main valve : Manual type gate valve
 - Fore line valve : Pneumatic type angle valve
 - Roughing line valve : Manual type angle valve
 - Auto vent line
 - Stainless steel hard line and flexible bellows line



< Cryo pump >



< Rotary pump >



< Pressure gauge set >



< Automatic pressure controller
& Throttle valve >

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Specifications



Specifications

Gas Delivery Module

- Used gases & flow control
 - Process : Ar : MFC – 1EA
 - O2 : MFC – 1EA
 - Purge & vent : N2 : Metering valve
- Gas valves & gas line
 - Pneumatic diaphragm valve
 - Metering valve for N2 purge & vent
 - The gas line is helium-leak tested to 10^{-8} Torr·L/sec.
 - All gas lines are welded by auto-welding method with VCR fitting.
 - Tubing of 316L stainless steel, micro-polished



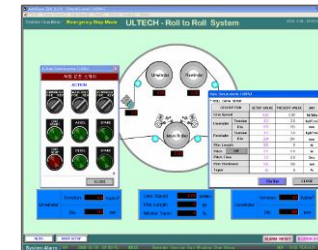
< Gas Delivery module >

Specifications

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Control Module

- System control
 - System is controlled automatically by PC
- 19" standard rack with electrical contact mechanism
 - Electrical power drive panel (ON/OFF/Emergency switch)
 - RF power control panel
 - Pulsed DC power control panel
 - Vacuum gauge controller panel
 - Pressure controller panel
 - Temperature controller panel
- Heater temperature control unit
 - Thermocouple : K-type
 - Temperature controller
 - SCR unit



< Roll control GUI >



Specifications

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Frame Module

- System frame is mild steel
- White & Blue colored panels & frame covers
- 19inch control panel mountable
- Easily movable casters & leveling foots



Specifications

(SPS-R2R series)

Warranty

Manufacturer warrants for a period of one(1) year from the final acceptance.

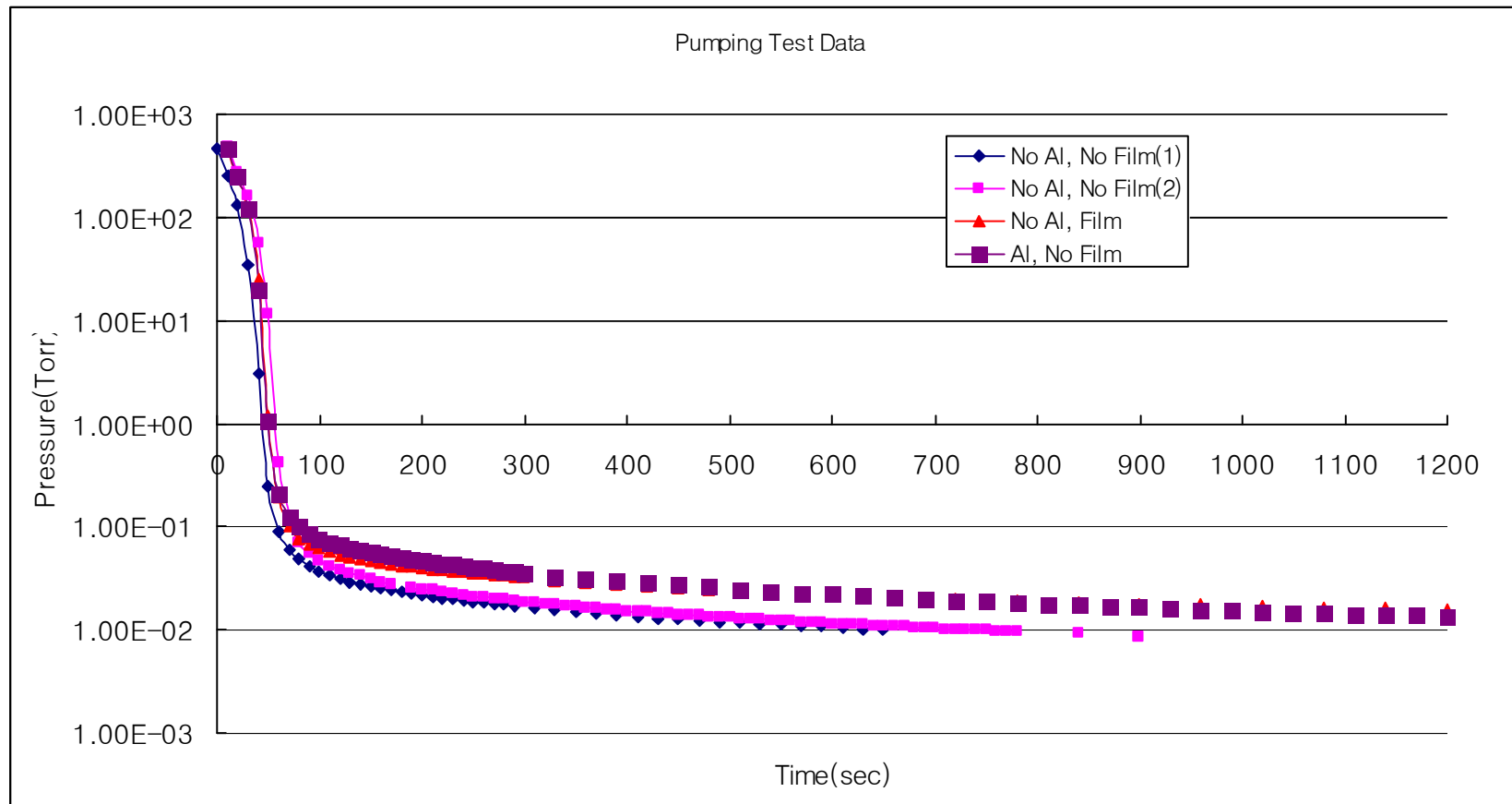
This warranty shall become null and void upon any modification and/or improper service performed to the equipment by the customer. This warranty shall not be extended to those defects caused by improper operation, maintenance and handling by the customer.

All consumable, such as O-rings, Heating lamp, Thermocouple, view port glasses, gauge sensors, fuses and others, are entirely excluded from warranty.

Hardware Data

(SPS-R2R series)

Pumping Data



Hardware Data

(SPS-R2R series)

Heating test data

Method	* Gas : No gas flow * <u>Pressure</u> : 3.4E-2Torr ,Heater 저항: 24.2Ω * Throttle valve : Full open							
Specification	* Ramping rate : Direct ramping up * Temp. control : K-type T/C, SCR control * Check time : Delay 20 min after reaching set temp.							
NO.	INNTER temp(℃)	HEATER TEMP						비고
		F	R	L	R	T	B	
1	72	100	100	100	100	100	100	* 100℃ auto tuning
2	80	110	110	110	110	110	110	
3	96	110	110	120	120	120	120	
4	100	110	110	120	120	130	130	



Hardware Data

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Film run test data

Specification	300mm film install		
PULSE	SPEED	TORQUE	비고
20	960mm/min	60%	
200	1960mm/min	60%	
550	5000mm/min	60%	

Process Data

(SPS-R2R series)

Process Data

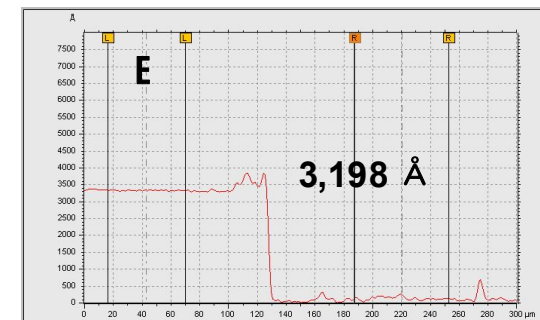
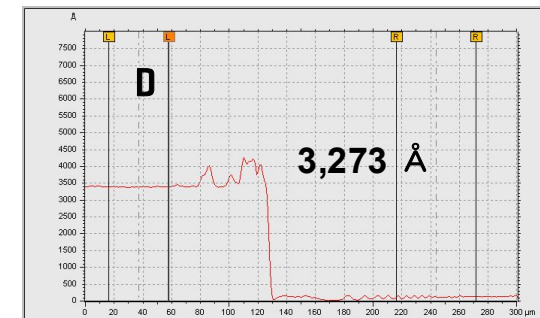
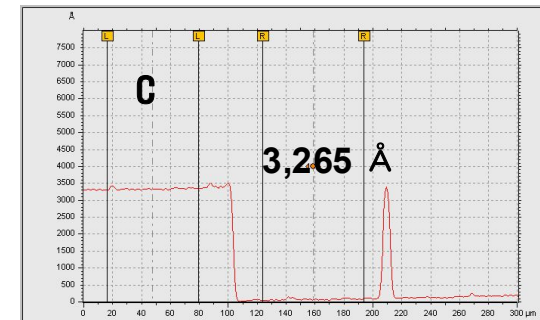
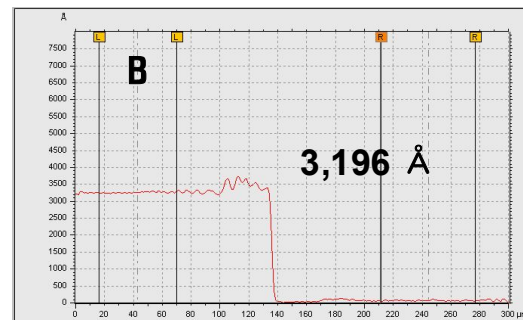
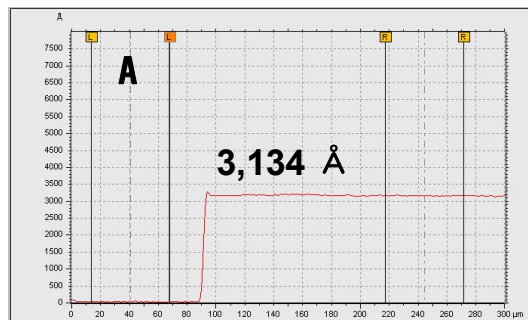
► Process results – Sheet resist., thickness measured

Item	Position (1,100 mm film 5 분할)					Avg.	resistivity ($\Omega \cdot \text{cm}$)
	A	B	C	D	E		
Thickness ($\text{\AA}$)	3,134	3,196	3,273	3,198	3,265	3,213	1.76×10^{-3}
Sheet resist. (Ω/sq)	54.3	61.9	50.0	53.5	54.3	54.8	

. Film ($t=100 \mu\text{m}$)

. Target ($\text{ZnO}_2 : \text{Al}_2\text{O}_3 = 98 : 2$)

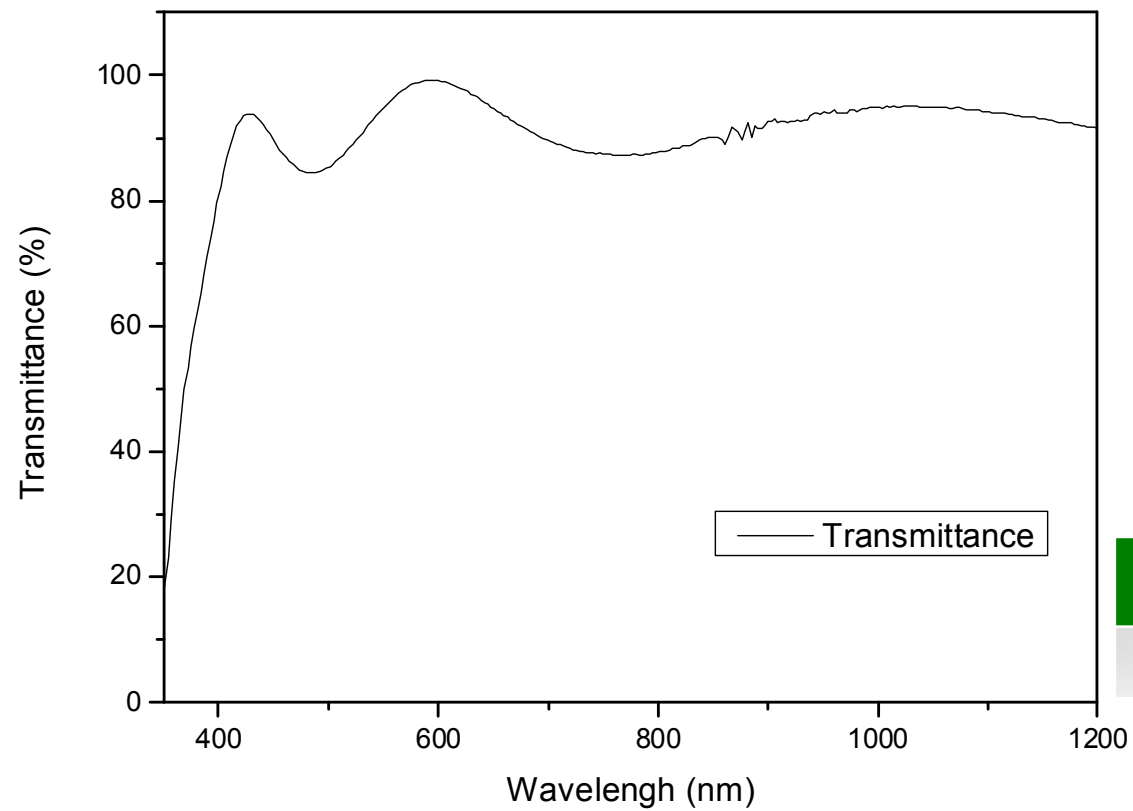
Thickness uniformity : $\pm 2.16 \%$



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Process Data

► Process results – Transmittance



Transmittance (%)
[350 ~ 1200 nm average.]

89.7

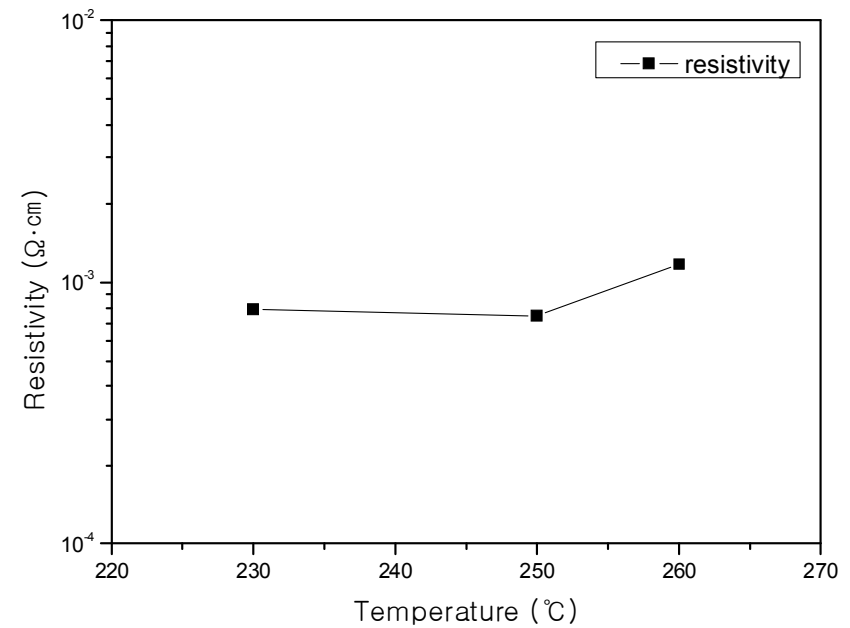
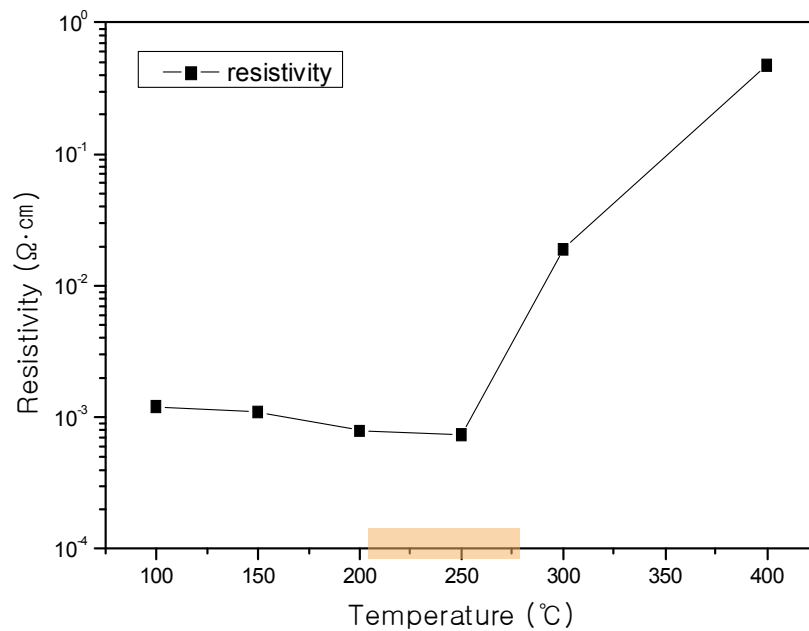
Process Data

(SPS-R2R series)

Process Data

► Process results – Transmittance

AZO film thermal treatment : ?? mTorr , time ?? min

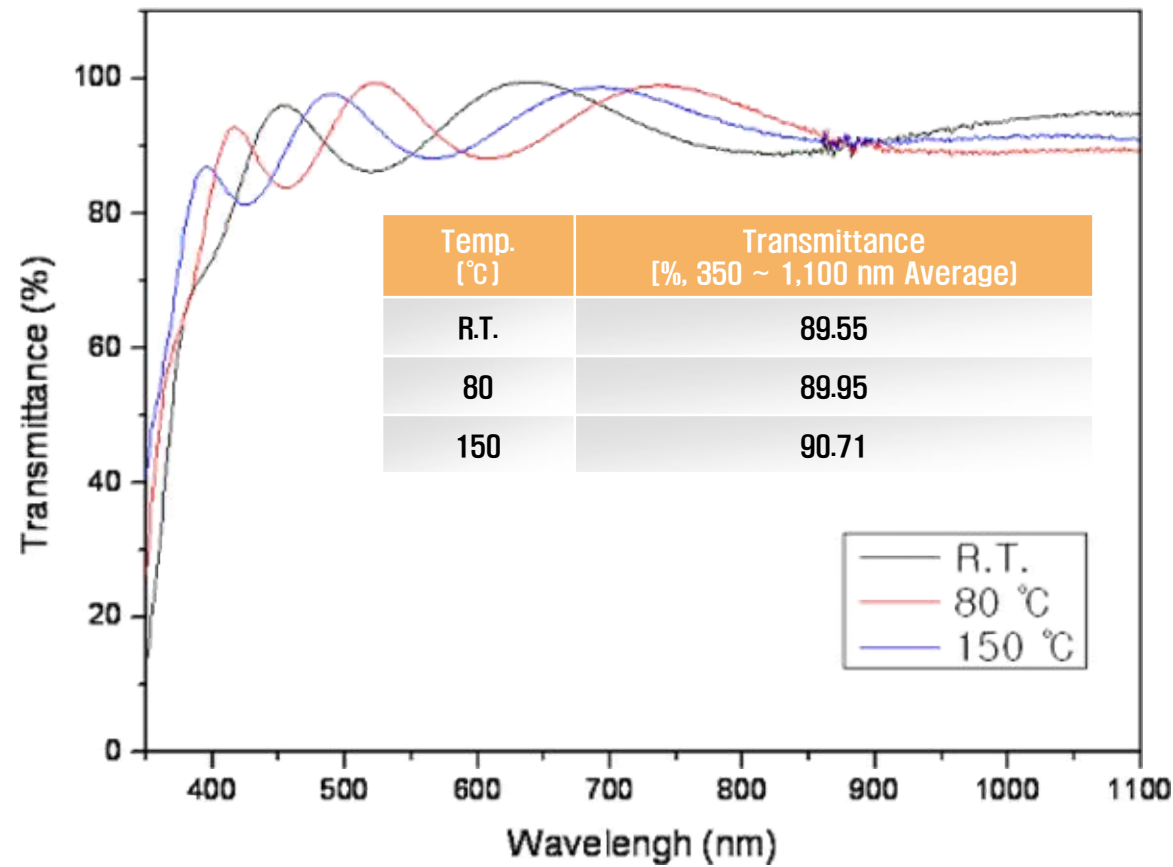


Process Data

(SPS-R2R series)

Process Data

[substrate temp vs AZO film transmittance]



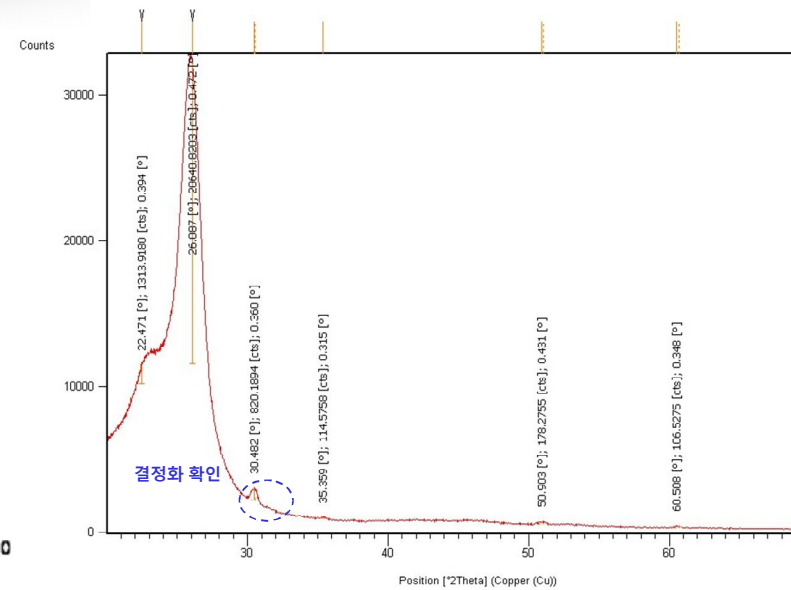
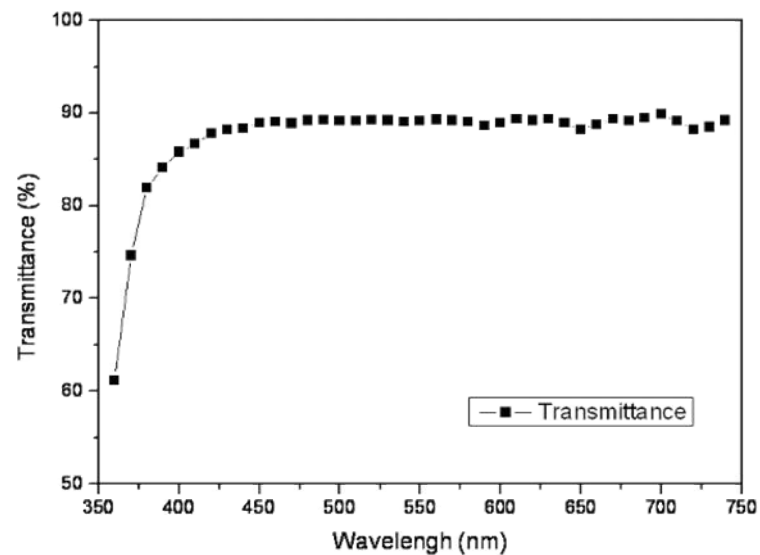
Process Data

(SPS-R2R series)

Process Data

DC pulse power (W)	Pressure (mTorr)	gas flow rate (sccm)			Time (sec)
		Ar	O2	O2/(Ar+O2)	
??	??	??	??	??	??

Sheet resist. (Ω /sq)		Color Diff.	Transmittance (% @ 550 nm)
Before annealing	After annealing		
320	246	0.33	89.14



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