WJ 16CVD APCVD SYSTEMS

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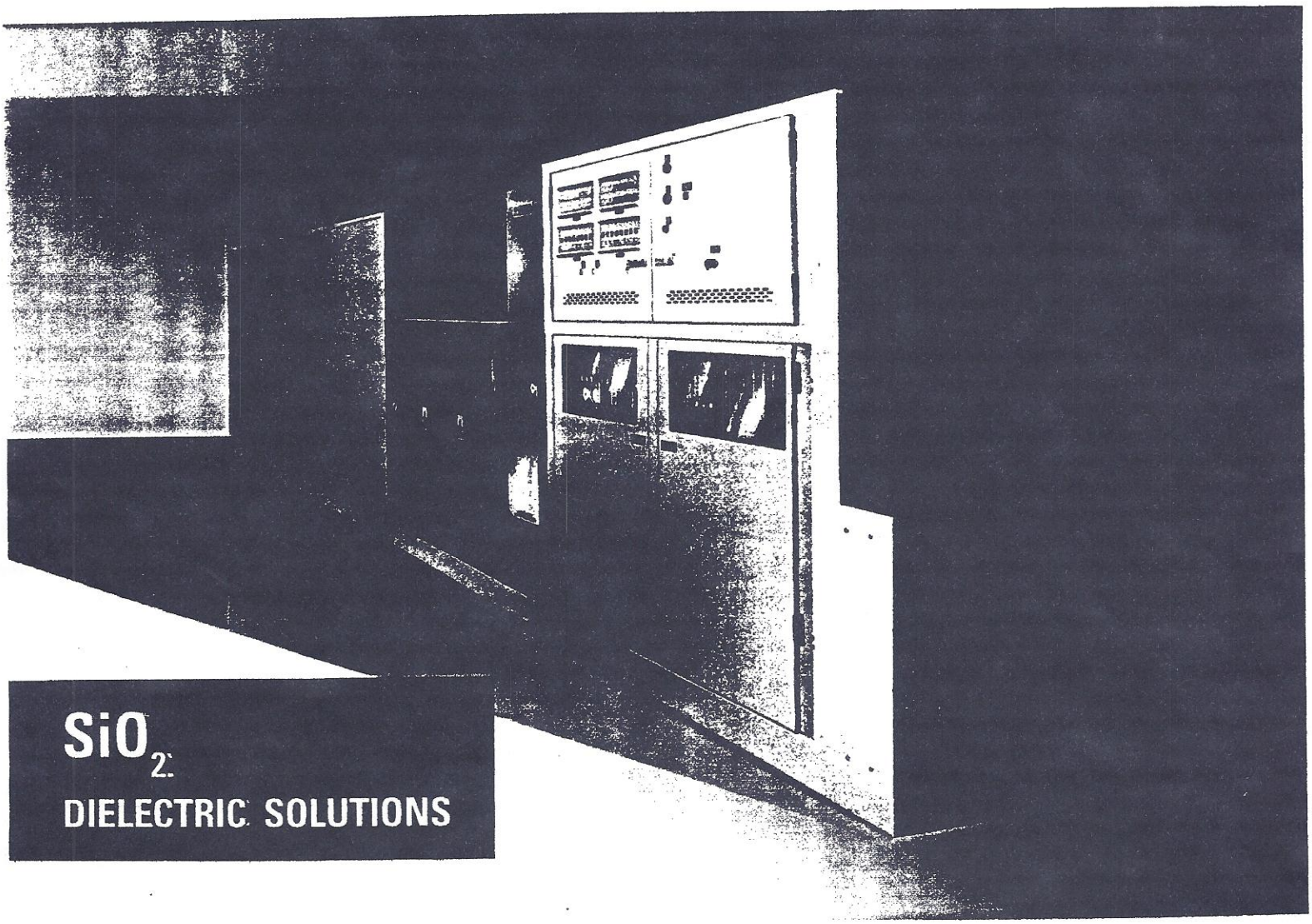
Volume Flat Panel Display Manufacturing



SiO_2
DIELECTRIC SOLUTIONS

Watkins-Johnson Company
Flat Panel Display Operations

FLAT PANEL DISPLAY OPERATIONS

WJ 16CVD APCVD SYSTEMS

Volume Flat Panel Display Manufacturing

THE SYSTEM

WJ 16CVD APCVD Systems are high-throughput, large-area (400mm x 500mm) SiO_2 deposition systems for AMLCD and FED device processing. Based on the same continuous-processing architecture qualified in over 700 other WJ APCVD systems for VLSI/ULSI applications worldwide, the 16CVD offers the excellent process reproducibility and critical particulate control required for world class volume FPD processing.

THE PROCESS

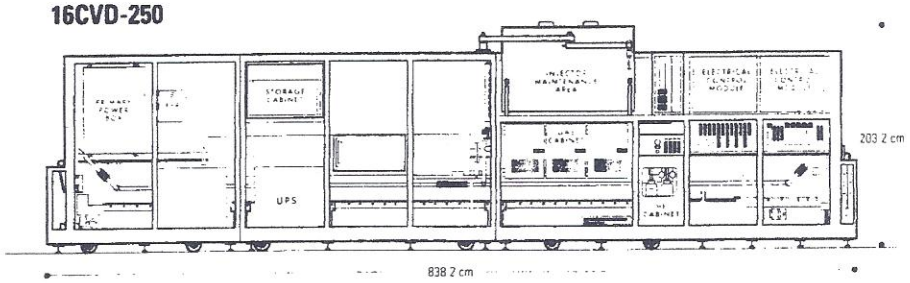
Superior quality APCVD SiO_2 films for TFT gate-insulator processes result in improved device yields and superior device performance. SiO_2 films are also an excellent choice for critical interlayer (metal-metal, metal-ITO) applications in TFT arrays as well as for substrate and device-passivation applications.

THE WJ COST OF OWNERSHIP ADVANTAGE

Proprietary injector and deposition chamber designs produce superior film uniformity and reproducibility. Reliable continuous processing architecture, efficient chemical consumption, and guaranteed 80% utilization capability result in the lowest cost per substrate available. WJ's technological excellence, superior film solutions and lowest cost of ownership has made WJ the worldwide market leader in advanced APCVD technology.

SYSTEM CONFIGURATIONS

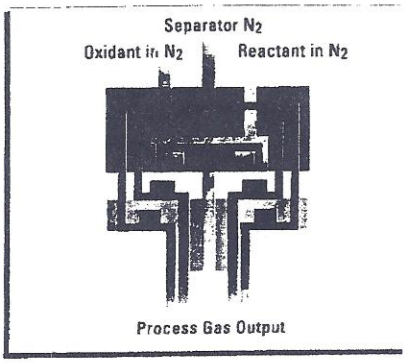
16CVD-250



Two 16CVD configurations are available to meet a wide range of customer requirements. Shown here is the 16CVD-250, WJ's highest throughput production system. More than 57 industry-standard 370 x 470mm panels can be processed per hour. WJ's Modular Automated Substrate (MAS) Handler System is standard on all WJ 16CVD systems.

WJ'S LINEAR INJECTOR

WJ's proprietary Linear Injector separates the flows of reactant and oxygen with a flow of nitrogen. These separate laminar flows confine the reaction to the substrate surface, thereby eliminating gas-phase prereaction and particulate formation. This unique design, proven over 15 years of production use, delivers the excellent repeatability and high productivity that world-class FPD manufacturing demands.



WJ 16CVD APCVD Features

AUTOMATED SUBSTRATE HANDLING SYSTEM

All 16CVD Systems are equipped with a WJ Modular Automated Substrate (MAS) Handler System. Because this system is modular, the customer is afforded a wide variety of system/handler operational configurations, to meet changing manufacturing requirements.

CONTINUOUS PROCESSING ARCHITECTURE

A continuous conveyor, incorporating in-situ cleaning, ensures highly efficient substrate transport. Stable thermal conditions are maintained for each substrate, resulting in excellent substrate-to-substrate thickness uniformity. Independent deposition chambers result in higher throughput, superior uniformity, and the ability to produce custom layered films with the system's dopants capability (i.e. BSG, PSG, BPSG).

PROPRIETARY INJECTOR DESIGN

A proprietary injector design incorporating separated laminar process gas flows controls the diffusion mixing of the gases and ensures that gas-phase prereaction and particulate formation are minimized.

IN-SITU TRANSPORT CLEANING

HF vapor etch, dual ultrasonic tanks, dual rotating brush tanks with DI water sprays minimize transport system contamination levels before substrates are processed.

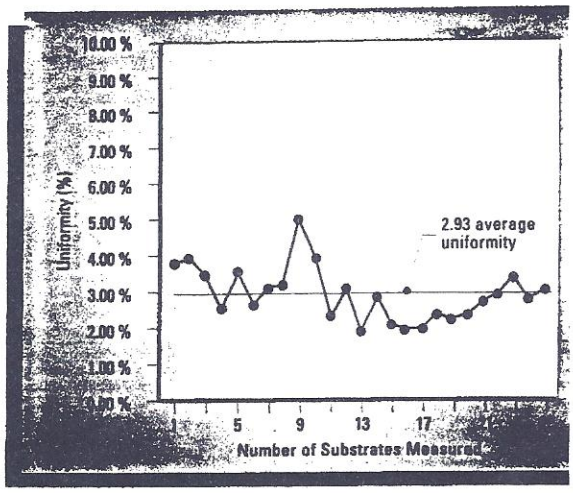
THERMAL MANAGEMENT FEATURES

Individually controlled, high-density heating elements in a multi-zone arrangement produce the outstanding thermal control needed to properly manage substrate heating, temperature maintenance and cooling, thus minimizing shrinkage and warpage.

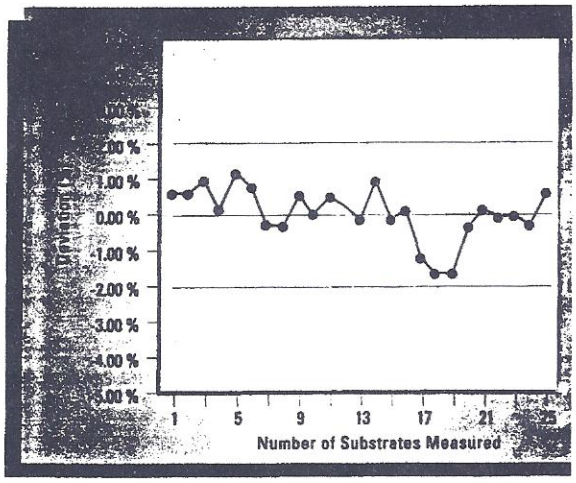
0.7mm HERE NOW

WJ 16CVD systems are capable of processing substrates up to 400 x 500mm and as thin as 0.7mm. Throughput is unmatched by any other CVD equipment and cost per substrate is lower by a factor of 2 or more compared to other systems. No hardware modifications are required to process other size substrates up to 400mm wide.

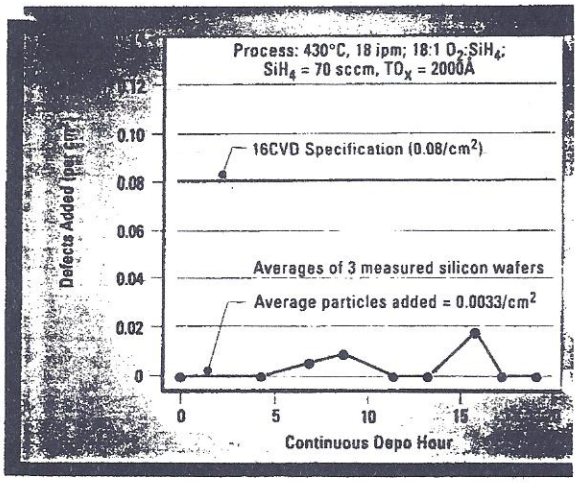
Typical within-substrate uniformity for 360 x 450mm substrate with 9 point range measurement.



Excellent substrate-to-substrate thickness uniformity as shown in this plot of percent deviation from the mean thickness of all substrates.



Critical particulate control: The 16CVD can meet the most stringent requirements for contamination control.



WJ is at the forefront as FPD manufacturers move to 0.7 and 0.5mm thick substrates. Advanced thermal processing features of the 16CVD minimize thermal shock to the substrate and keep shrinkage numbers low–where FPD manufacturers demand them.

Glass Type	Thickness	Shrinkage (µm) 22 ipm (Belt Speed) No Deposition Mean	10 ipm (Belt Speed) No Deposition Mean	18 ipm (Belt Speed) 3200 Å - 430°C Mean
7059	1.1 mm	3	8	3
1737	1.1 mm	1	3	2
1737 Special Anneal	1.1 mm	0	0	0
1737	0.7 mm	2	5	3

FLAT PANEL DISPLAY OPERATIONS

WJ-16CVD APCVD SYSTEMS

16CVD-250 and 16CVD-140

SPECIFICATION SUMMARY

Volume Flat Panel Display Manufacturing

Performance Specifications: 16CVD-250
(3500 Å SiO_2, 430°C @ 18 ipm, 370 x 470 mm x 0.7 mm Corning 1737, or equivalent)

Thickness Uniformity:		
within substrate	<±5%	(9 point range measurement)
substrate to substrate	<±5%	
Refractive Index:	1.45 ± 0.02	
Wet Etch Rate:	≈500-700 Å/min	(130 BHF, 22°C) (30 part 40% NH_4F : 1 part 49% HF)
Film Stress:	<2 x 10^9 dynes/cm^2	
Particles added per cm^2:	<0.10, >0.3µm	(N_2 only)
Dielectric Breakdown:	>8 MV/cm	(forming gas anneal, 30 min)
Dielectric Constant:	≈ 4-4.5	(forming gas anneal, 30 min)
Throughput:		
400 x 300 mm	88+ plates/hr	(3500 Å SiO_2, 18 ipm, 10 mm load gap)
370 x 470 mm	57+ plates/hr	(3500 Å SiO_2, 18 ipm, 10 mm load gap)
400 x 500 mm	53+ plates/hr	(3500 Å SiO_2, 18 ipm, 10 mm load gap)
Guaranteed Utilization:	>80%	

Utility Requirements 16CVD-250 and 16CVD-140

Electrical Power:	208 VAC ±5%, 3 phase, 50/60 Hz, 225 Amps max.			
Process Gases:				
Nitrogen	425 lpm	(15 CFM)	@ 44-55 PSIG	(3.2-3.8 Kg/cm^2)
SiH_4 Purge/Dilution N_2	28 lpm	(1 CFM)	@ 25-35 PSIG	(1.8-2.5 Kg/cm^2)
Silane (100%)	200 sccm		@ 25-35 PSIG	(1.8-2.5 Kg/cm^2)
Oxygen	30 lpm	(1 CFM)	@ 25-35 PSIG	(1.8-2.5 Kg/cm^2)
General Facilities:				
DI Water	26.5 lpm	(7 GPM)	@ 20-60 PSIG	(1.4-4.2 Kg/cm^2)
Air Knife CDA/N_2	520 lpm	(18.2 CFM)	@ 60-100 PSIG	(4.2-7.0 Kg/cm^2)
Control Air	1 lpm	(2 CFH)	@ 100-110 PSIG	(7.0-7.8 Kg/cm^2)
Cooling Water	9.5 lpm	(2.5 GPM)	@ 60 PSIG min	(4.2 Kg/cm^2 min)
Exhaust:				
Safety Exhaust	22.6 klpm	(800 CFM)	@ 1.5 in H_2O	(38.1 mm H_2O)
Gas Cabinet Exhaust	16.9 klpm	(600 CFM)	@ 1.5 in H_2O	(38.1 mm H_2O)
Etcher Exhaust	710 lpm	(25 CFM)	@ 1.0 in H_2O	(25.4 mm H_2O)
Process Exhaust	425 lpm	(15 CFM)	@ 2.0 in H_2O ±0.02 in H_2O	(50.8 mm H_2O)
Belt Dryer Exhaust	5 klpm	(175 CFM)	@ 1.5 in H_2O	(38.1 mm H_2O)

System Options
- GEM-Compliant SECS II Interface
- Hydride Dopants Capability (PSG, BBG, BPSG)

Distributed by:

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