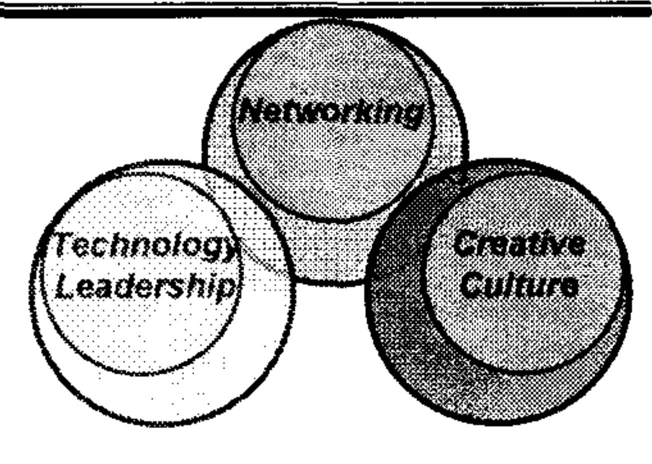
발표주제 4

ADP DRY ETCHER TECHNOLOGY

김정태 전무이사, 에이디피엔지니어링



ADP DRY ETCHER TECHNOLOGY

2008. 5. 16

김 정 태

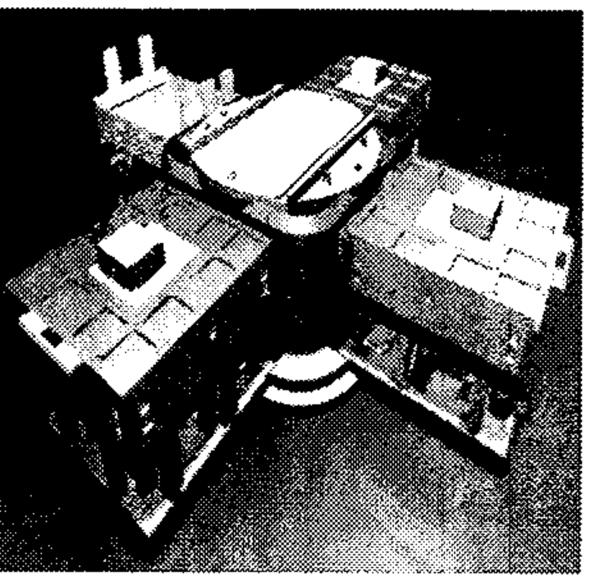
Outline

- ADP Engineering
- LCD Dry Etcher Technology
- Process Results
- Plasma Sources for Semiconductor Dry Etching
- Core Technology for Semiconductor Oxide Etcher-1
- Core Technology for Semiconductor Oxide Etcher-2
- Summary

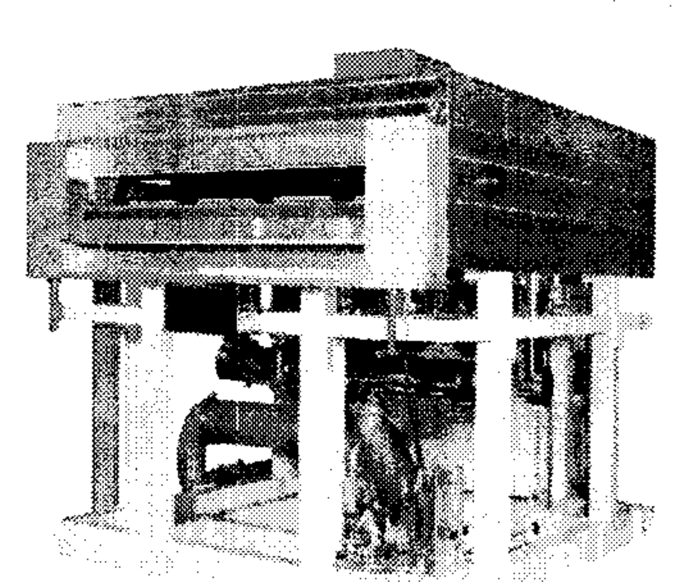
ADP Engineering

회사명	㈜ 에이디피엔지니어링
C.E.O	허광호
법인 설립일	2001년 1월 26일
코스닥 상장일	2005년 2월 4일
자본금	96억
매출액	1200 억 예상 (2008년)
주요 제품	LCD/ 반도체
본사	경기도 성남시 중원구 상대원동 333-5번지
직원수	210 명(2008 년 2월 기준)
홈페이지 주소	www.adpeng.com

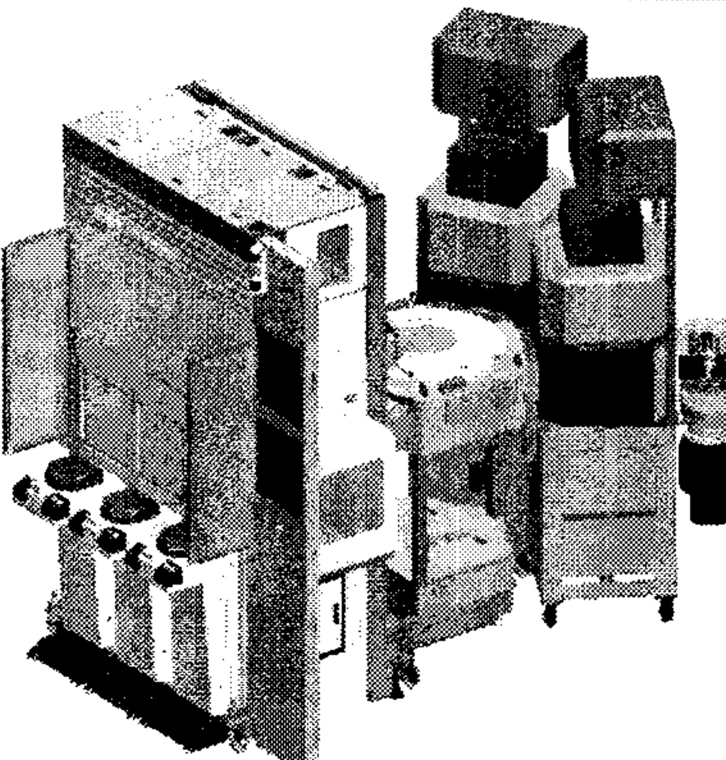
Plasma Related Products



Dry Etcher (50ch.)

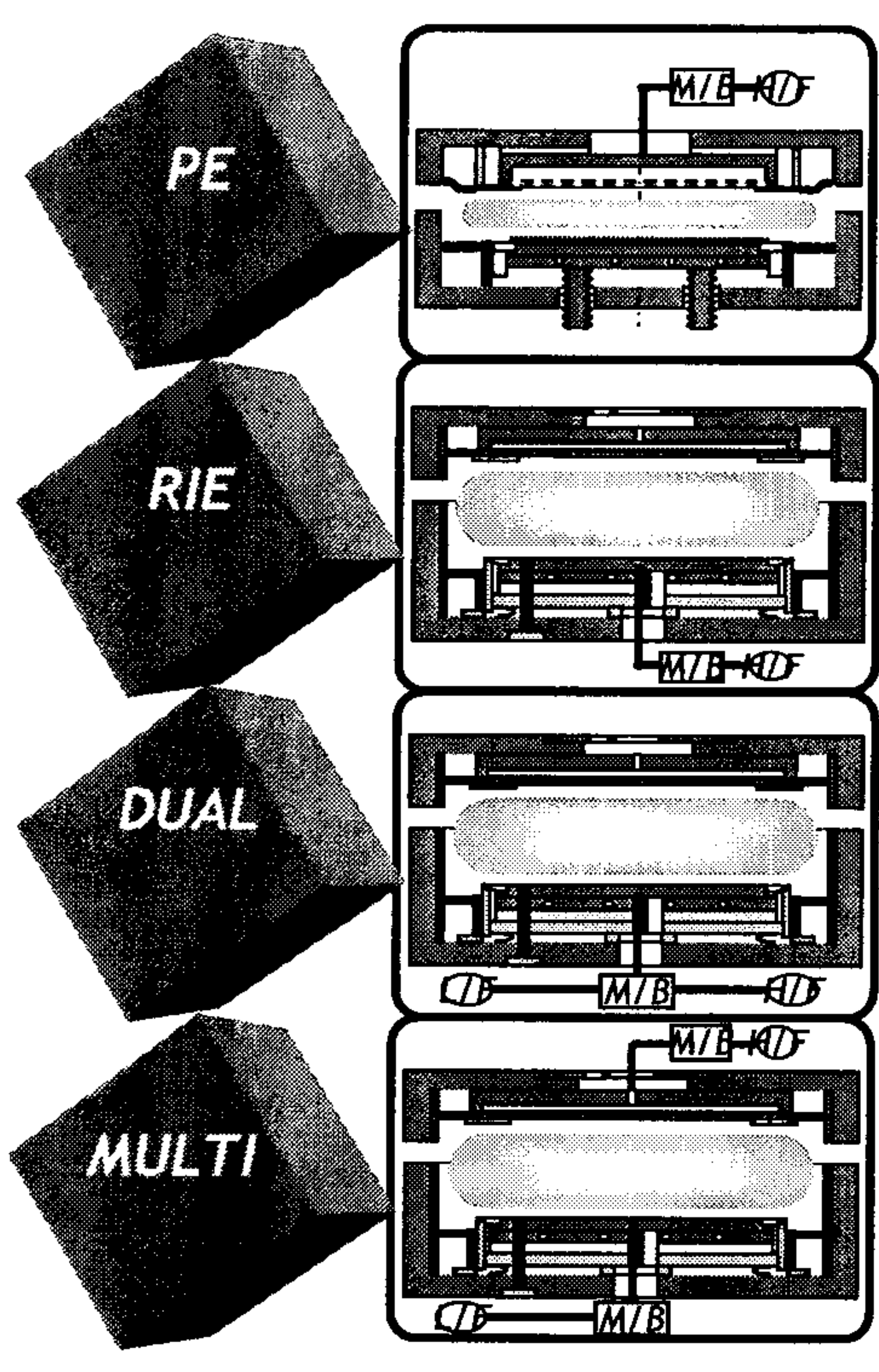


Plasma Asher (23ch.)



Plasma Ion Doping

LCD Dry Etcher Technology



- Plasma Source: RF Frequency Control Technology(3.39~13.56 Mhz)
  - -> Plasma Density & Ion Energy Control
  - 1) Optimized L/H Frequency Control-> Plasma Stability
  - 2) Optimized Power Control-> Etch Rate/ Uniformity
  - 3) Optimized Bottom Power Control-> Damage Control
- Uniform Gas Control-> Diffuser/Showerhead Gas Injection-> Enhanced Uniformity
- Optimized Chamber Design -> Process gap/Wall gap Optimization
- ESC Dielectric Material Optimization-> Enhanced Etch Rate
- Chamber Temp. Control (Showerhead /Wall/ ESC)-> Uniformity/Particle

Process Results

	LCD Passivation Etch		반도체 Oxide Etch
Uniformity (%)	≤ 15	≤ 9	≤ 3
Etch rate (Å/min)	≥ 5000	5438	≥ 2500
Taper angle	$40° \le \theta \le 70°$	$\theta \le 68°$	$87° \le \theta \le 90°$
Selectivity	≥ 5	≥ 6~8	≥ 4
End point detect	Detectable	Detectable	Detectable
Throughput	20ea/hr	20ea/hr	30ea/hr

◆ CCP Source: Chamber Volume↓ -> Better Uniformity

Plasma Sources for Semiconductor Dry Etching

	Oxide Etch	Poly + Metal Etch
Plasma Source	CCP (Dual, Triple, Quad mode)	ICP
Pressure (mtorr)	~100	~10
Ne (Cm^{-3})	10^{10}	10^{11}
Te (eV)	1 ~ 2	3 ~ 5
RF Frequency	Dual : 27Mhz + 2Mhz Triple : 60Mhz + 27Mhz + 2Mhz	High Frequency (13.56 Mhz)
Material Property	Hard	Soft
Ion Energy	High Ion Energy	Low Ion Energy (Plasma damage)
Chamber Volume	Small	Large
Reproducibility	Polymer↓ → Reproducibility↑	Polymer↑ → Reproducibility↓

Core Technology for Semiconductor Oxide Etcher-1

Plasma Source

- CCP Mode (Dual/Triple)
- -> Te/Ne ↑

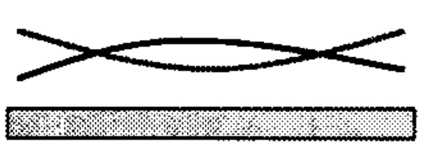
Low Pressure Process

- Micro-loading Effect
- High Conductance Chamber Design

Core Technology

RF Frequency Control

- Dual : 27Mhz+2Mhz
- -> Ne/Ei↑
- Triple: 60Mhz+27Mhz+2Mhz
- -> Good Uniformity



Radical/Flux Analysis

- Etching Rate
- Side Wall Passivation
- Profile

ArF HARC Etching

- High Aspect Ratio Contact

Core Technology for Semiconductor Oxide Etcher-2

Chamber Design

- Process gap/Wall gap Optimization
- -> Simulation Tech :
  Gas Flux/ Plasma Density/ Te

ESC Dielectric Materials

- Dielectric Materials Properties
- -> Etching Rate

Core Technology

Chamber Temp. Control

- Showerhead/Wall/ESC Temp. Control
- -> Polymer Removal/Uniformity

Uniform Gas Injection

- Gas Injector Type/ Flow Dynamics
- -> Uniformity

Summary

- High Density Plasma Source-CCP-Dual/Triple, RF Frequency Control
- Radical/Flux Analysis
- Low Pressure Process
- Chamber Design (Process gap/Wall gap)
- Chamber Temp. Control
- ESC Dielectric Materials
- Uniform Gas Injection