

물 품 구 매 계 약 서

비
밀

행정본부 구매팀

TEL:원내 0852 담당: 신현웅

계약번호: EA20041902

계약건명: Nano AL-CVD Cluster System(1set) 제조구매설치

계약기간: 2004년 9월 15일 ~ 2004년 11월 10일

납품장소: 연구원 지정장소

계약금액: ₩1,460,000,000원(VAT 포함)

계약보증금	₩146,000,000	[대금지급계좌내역]
지체상금율(1일당)	1.5/1000	지급은행:
하자보수보증금율	5%	지정명:
하자보수보증기간	2년	계좌번호:
대금지급조건 및 결제방법 등	카드결제/계좌이체(송금수수료공제)	예금주:
특기사항 : 대금 2차 분리 지급 - 천금지급요구시(₩730,000,000), 설치검수 완료 후 잔금지급(₩730,000,000)		

위의 계약을 체결함에 있어 갑과 을(연대보증인이 있는 경우 연대)은 입찰유의서, 계약일반조건, 계약
특수조건, 현장 사양(규격)설명사항, 설계서(시방서) 등의 모든 조건이 이 계약의 일부가 됨을 수락하고,
위의 금액으로 계약기한내에 이 계약을 완료 할 것을 확약합니다.

2004년 9월 일

(갑)

주 소: 대전광역시 유성구 가정동 161

상 호: 한국전자통신연구원

원 장: 임 주 환

(을)

주 소: 경기도 평택시 지제동 33

상 호: 쭈아이피에스

대표자: 장 호 승

(연대보증인)

주 소:

상 호:

대표자:

(연대보증인)

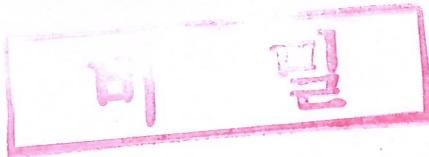
주 소:

상 호:

대표자:

AL-CVD Cluster System 기술내용 (장비 규격 및 스케)

구분	기술내용	부고
General Features	<p>1. Dielectric ALD Process Module.</p> <ul style="list-style-type: none"> - High-K Dielectric Film Deposition <p>2. Remote Plasma Rapid Thermal Process Module.</p> <ul style="list-style-type: none"> - Surface Treatment, Rapid Thermal Anneal, Native oxide removal, SiO(N) dielectric Growth <p>3. Brooks Cluster Back-bone Transfer Module.</p> <ul style="list-style-type: none"> - 125/150/200mm silicon wafer bridge Cluster Back-Bone with 3 process modules, 2 load-locks, one cooling stages, and a aligner. <p>4. Cluster operating Software :</p> <ul style="list-style-type: none"> - User interface via NT based computer running the software suite for cluster system control, including test and diagnostic facilities. Ethernet interface and remote monitor software should be also provided. Operating Software (Main control, PMC, etc.) <p>5. All system spec. and parts spec. should be better than standard model one.</p>	
System Hardware Requirement	<p>1. Transfer Module :</p> <ul style="list-style-type: none"> 1-1. 필수 요구 사항 <ul style="list-style-type: none"> - Two Load-lock 	





	<ul style="list-style-type: none">- Single Wafer Alignment stage- One or Two Cooling Stage- Five 200mm Slot Valve(RTP 1 개 포함)
	<p>1-2. 일반요구사항</p> <ul style="list-style-type: none">- Base Pressure : $< 1 \times 10^{-3}$ Torr- Pump Down Time to base pressure : $< 10\text{min}$ @ R.T- Leak Rate : $< 5 \times 10^{-3}$ Torr/min @ R.T (R.O.R : 5mTorr)- Main Power : 208V, 3phase, 60Hz <p>2. Process Module</p> <p>2-1. ALD Process Module</p> <p>2-1-1. Chamber</p> <p>2-1-1-1. 요구규격</p> <ul style="list-style-type: none">Wafer Size : 125mm, 150mm, 200mmWafer Temperature Uniformity : $< \pm 1.5^\circ\text{C}$ @ 300°CWafer Back-side deposition : NoChamber Cleaning Cycle : 5000wafer @ HfO₂ 3nm/waferBase Pressure : $< 1 \times 10^{-3}$ TorrLeak Rate : $< 5 \times 10^{-3}$ Torr/min @ 300°CValve Switching Time : < 0.1 sec <p>2-1-1-2. 일반요구규격</p> <ul style="list-style-type: none">Wafer Temperature : R.T ~ 650°C

부록

Pump Down Time to base pressure : <10min @ R.T
Process Pressure : 0.1~10Torr
Built in analysis Port for Process Monitor
Reaction Energy Source : Maker recommend
(O3 or Direct Plasma with thermal energy)

2-1-2. Source & Gas Line

2-1-2-1. 필수요구규격

Source Line Heating : R.T ~ 200 °C

Source Line Temperature Uniformity : < ±2 °C @ 150 °C

Separate Reactive Gas Feeding

Source(3) : Al, Hf, Si

Gas (6) : H2, O2, N2, Ar, NH3, SiH4

2-1-2-2. 일반요구규격

Gas Spare line (N2) : 2 ea

2-2. RP-RTP Process Module

2-2-1. 필수요구규격

- Wafer Size : 125mm, 150mm, +other kits(Customer specified)

- Temperature Sensor : 2 Pyrometer(High Temp.(1), Low Temp.(1))

- Temperature Uniformity : <±2 °C @ 400~1000 °C

- Temperature repeatability : <±2 °C @ 400~1000 °C

부록

- Lamp Life time : > 4000hr @ 1000°C
- Particle : < 20ea @ > 0.16um, 5mm edge exclusion
- Metallic ion : < 5E10 atoms/cm² measured by ICP-MS
- Process Pressure : 1~760 Torr
- Leak Rate : < 5x10⁻³ Torr/min @ Base Pressure
- Gas : N₂, O₂, N₂O, NH₃, Ar, H₂
- Remote Plasma Module : Ionization ratio > 1010 atoms/cm³
- Plasma Power : 500~3000Watt

2-2-2. 일반요구규격

- Tungsten-Halogen Lamp Heating : 250 ~ 1000°C by pyrometer
- Ramp-up Rate : >100 °C/sec @ ~400~1000 °C
- Ramp-Down rate : >30 °C/sec @ 800~1000 °C
- Base Pressure : < 5x10⁻³ Torr
- Power : 460V, 3phase

3. 기타

3-1. Vacuum

3-1-1. Base Pressure

- i. Loadlock module : < 1E-3Torr
- ii. Transfer module : < 1E-3Torr
- iii. ALD Process module : < 1E-3Torr
- iv. RTP Process module : < 1E-3Torr

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3-1-2. Leak rate

- i. Loadlock module : < 0.3mTorr/min
- ii. Transfer module : < 0.1mTorr/min
- iii. ALD Process module : < 0.3mTorr/min
- iv. RTP Process module : < 5mTorr/min

3-2. Gas

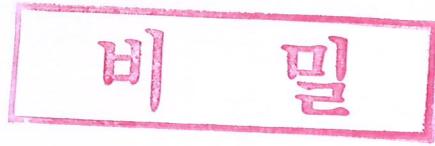
3-2-1. Gas flow

- i. MFC over shoot : < $\pm 1\%$ of full scale after 2 sec of flow
- ii. Actual flow deviation : < $\pm 1\%$ of full scale
 - All gas line with including gas filter (0.01um)
 - Gas line purge of all the process gas

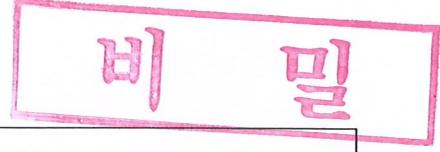
3-3. Safety

- Inter-locks to prevent hazardous mixing of gasses in hardware and software
- Over temperature should be checked and interlocked
- Gas leak should be monitored by built-in sensor, inter-locked and alarmed.
 - Chamber over pressure interlock
 - System safety data should be attached

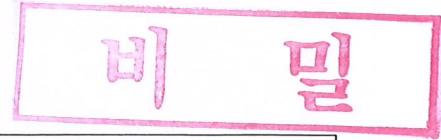
System Process Requirement	<p>1. ALD Process Spec.</p> <p>1-1. HfO₂ Film Spec.</p> <p>1-1-1. 펄수요 구구격</p> <ul style="list-style-type: none"> - Source : TEMAHF Oxidation Energy & Gas Source : H₂O(default), O₂ plasma or O₃ Carrier & Purge Gas : Ar or N₂ - Film Thickness Uniformity : <2% @ 5nm HfO₂, 5mm edge exclusion, >49 points measure - Particle : < 20ea (size > 0.12um) on 5" wafer, >49 points measure <p>1-1-2. 일반요구규격</p> <ul style="list-style-type: none"> - Process condition (After as-deposition without curing and other treatment) <ul style="list-style-type: none"> Temp. : 200~400°C Pressure : 0.1~10 Torr Cycle Time : < 3sec - Step coverage 90% @ (aspect ratio > 10, 0.1um hole, 10nm HfO film) - Film Composition Uniformity : <2% @ 5nm HfO₂, 5mm edge exclusion, >49 points measure - Added Film Surface Roughness (RMS) : <1.5 Å @ 5nm HfO₂, 5mm edge exclusion, >49 points measure - Film impurity (After as-deposition at 300 °C) <ul style="list-style-type: none"> : H content : < 2%
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	<ul style="list-style-type: none"> : C content : < 2% : Fe, Cu, Ni content : < 5E10 atoms/cm² : Cl content : < 1% - Dielectric Constant : > 12 (As-depo.) - Dielectric constant uniformity : Within wafer : < 2% (1sigma), 5mm edge exclusion, >49 points measure : Wafer to wafer : <2% (1sigma), 5mm edge exclusion, >49 points measure - Adhesion : No peel off (to silicon, oxide, nitride, Ti) - Throughput : > 15 wafers/hour (@ HfO₂ 4nm/wafer)
	<p>1-2. Al₂O₃ Film Spec.</p> <p>1-2-1. 필수 요구 규격</p> <ul style="list-style-type: none"> - Source : TMA Oxidation Energy & Gas Source : H₂O(default), O₂ plasma or O₃ Carrier & Purge Gas : Ar or N₂ - Film Thickness Uniformity : <2% @ 5nm Al₂O₃, 5mm edge exclusion, >49 points measure - Film Composition Uniformity : <2% @ 5nm Al₂O₃, 5mm edge exclusion, >49 points measure - Particle : < 20ea (size > 0.12um) on 5" wafer, >49 points measure <p>1-2-2. 일반 요구 규격</p>



	<ul style="list-style-type: none">- Process condition (After as-deposition without curing and other treatment)<ul style="list-style-type: none">Temp. : 200~500 °CPressure : 0.1~10 TorrCycle Time : < 3sec
	<ul style="list-style-type: none">- Step coverage<ul style="list-style-type: none">> 98% @ (aspect ratio > 15, 0.1um hole, 10nm Al₂O₃ film)- Added Film Surface Roughness (RMS) : <1 Å @ 5nm Al₂O₃, 5mm edge exclusion, >49 points measure- Dielectric Constant : > 12 (As-depo.)
	<ul style="list-style-type: none">- Film Impurity (After as-deposition at 300 °C)<ul style="list-style-type: none">: H content : < 1%: C content : < 1%: Fe, Cu, Ni content : < 5E10 atoms/cm²: Cl content : < 1%- Dielectric constant uniformity<ul style="list-style-type: none">: Within wafer : < 2% (1 sigma), 5mm edge exclusion, >49 points measure: Wafer to wafer : <2% (1 sigma), 5mm edge exclusion, >49 points measure- Adhesion : No peel off (to silicon, oxide, nitride, Ti)
	<p>1-2-3. 1) 타요구규격</p> <ul style="list-style-type: none">- Target Film



<ul style="list-style-type: none">- HfSiO(N), SiO(N), Si3N4, Al2O3- Throughput : > 15 wafers/hour (@ Al2O3 4nm/wafer).- System reliability<ul style="list-style-type: none">: MTBF (> 500 hour): MTTR (> 8 hour): Up-time (> 80%)	<h2>2. RPRTP Process Spec.</h2> <p>2-1. RTO Thickness 2.5nm @ 500°C (Ellipsometer)</p> <p>Uniformity : < 2%, 1sigma with edge 5mm exclusion, >49 points measure</p> <p>Repeatability : < 2%, 1sigma with edge 5mm exclusion, >50 wafer</p> <p>2-2. RTN Thickness 1nm @ 500°C (XPS, AES)</p> <p>Uniformity : < 2%, 1sigma with edge 5mm exclusion, >49 points measure</p> <p>Repeatability : < 2%, 1sigma with edge 5mm exclusion, >49 points measure</p> <p>2-3. Ni Silicide</p> <p>Temperature range : 250 ~ 650°C</p> <p>Uniformity : < ±3°C @ 320°C</p> <p>Silicide Thickness Uniformity : < 2%, 1sigma with edge 5mm exclusion, >49 points measure</p> <p>Process Repeatability : < 2%, 1sigma with edge 5mm exclusion, >50 wafer</p> <p>Rs (Ohms /square) : < 10 @ 20nm thickness,</p>
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	<p>Rs Uniformity : < 3%, 1sigma with edge 5mm exclusion, >49 points measure</p> <p>2-4. H2 Anneal</p> <p>Temperature : ~500 °C H2 Fraction : ~50% Pressure : 1~30Torr</p> <p>SiO₂ < Detection Limit (Ellipsometer Detection Limit)</p> <p>Added RMS Roughness < 0.1 nm, > 9 points measure with 5mm edge exclusion</p> <p>2-5. Vacuum Anneal</p> <p>Temperature : ~800 °C @ Base Pressure Temperature uniformity : < ±2 °C @ 800 °C</p>	
System General Requirement	<p>1. Delivery - 2004.11.10 까지]</p> <p>2. Warrant</p> <ul style="list-style-type: none"> - 2 year free labor and parts of hardware after the sign-off of acceptance test - 2 year free labor and upgrade of software after the sign-off of acceptance test <p>3. Installation</p> <ul style="list-style-type: none"> - Within 7 days after system arriving at install site, the final sign-off for acceptance should be done by ETRI responsible person, when installation is completely finished by maker's engineer and all requirements about the equipment performance of ETRI are satisfied. - Delayed fee was specified as a 1.5/1000 of total payment for system 	<p>ETRI</p> <p>ETRI</p>

per day.

4. Training

- Two process engineers and two maintenance engineers
- Period : Longer than 1 weeks
- All travel and training expenses should be paid by manufacturer
- System should be confirmed by ETRI engineer at manufacturer's site

5. Payment

- 선금 계약금액의 50%별부내에서 지급
- 설치점수 완료 후 잔금 지급

6. Spare parts

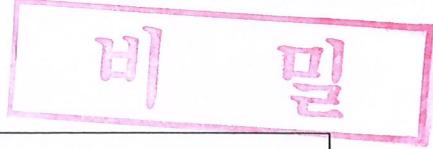
- 2 year guaranteed consummables and additional recommended spare parts (list should be attached)
- Repair parts (required more than 1 month in delivery, list should be attached)

7. Documents

- 2Sets of hard copies (1set for clean room usage)
- The manuals of operation and maintenance, drawing of electric circuit and system, full OEM(Original Equipment Manual) set should be included
- Software packages for system back-up should be included

8. After Service

- Per request, prompt service should be supplied



	<p>9. Others</p> <ul style="list-style-type: none"> - Application engineer should be resided at ETRI more than 4 weeks after installation - The acceptance test procedure about each test items should be attached in details
기타	<ol style="list-style-type: none"> 1. 금회에 도입하는 nano AL-CVD Cluster 시스템에 부착될 차년도 도입 예정인 추가 공정 모듈 (예 : Dielectric AL-CVD 등)에 대해서 무상으로 H.W/S.W 설치작업에 성실히 협조하여야 함 2. 향후 연구목적으로 공정모듈 및 부품추가나 구조변경 시 요구되는 H/W 및 S/W 변경작업에 대해서, - Warranty 기간 중 : 실비 (숙식비, 교통비, 부품비용, 제작비용 등)로 지원하여야 함 - Warranty 기간 외 : 실비 (숙식비, 교통비, 부품비용 등) 와 인건비 내에서 지원하여야 함 3. 금번에 납품되는 장비 성능이 요구공정 규격을 만족하지 못할 경우와 운전 중 성능하지가 발생할 경우에는, 조속히 장비개선을 해주어야 하며, 의도적인 자체나 불이행 시에 발생하는 모든 불이익에 대해서는 제작사의 책임임 4. 연구원 요구 시, 향후 제작사에서 개발되는 ALD 공정기술/장비기술/부품기술에 대하여, 실비로 지원을 하여야 함 5. 연구원의 요구에 따라 시설/환경에 적합하도록 장비설계 및 규격을 조정하여야 하며, 요구공정 규격을 충족시켜야 함 6. 연구원의 요구 시, 공정요구 규격을 충족시키면서, 장비설계 및 규격, utility 사양조정에 성실히 응하여야 함 7. 제작/납품/설치/시험평가 일정을 모두 준수하여야 하며, 완료 후 설치보고서, 시험평가서 제출 8. 연구원의 모든 안전규정 준수/작업규정준수/작업일정요구에 성실히 응하여야 함 2005년부터 2007년까지 분기별 장비 정기점검과 기술정보 제공을 의무로 함 9. 장비의 제작 상황을 파악하기 위하여 장비 제작 마일스톤에 따른 현재 진행 상황에 대하여 격주 단위로 ETRI에 보고할 것을 권고함. <p>10. ETRI 요청시 회사 방문 및 기술적 협의를 가질 수 있음.</p>

