CHA MARK 50

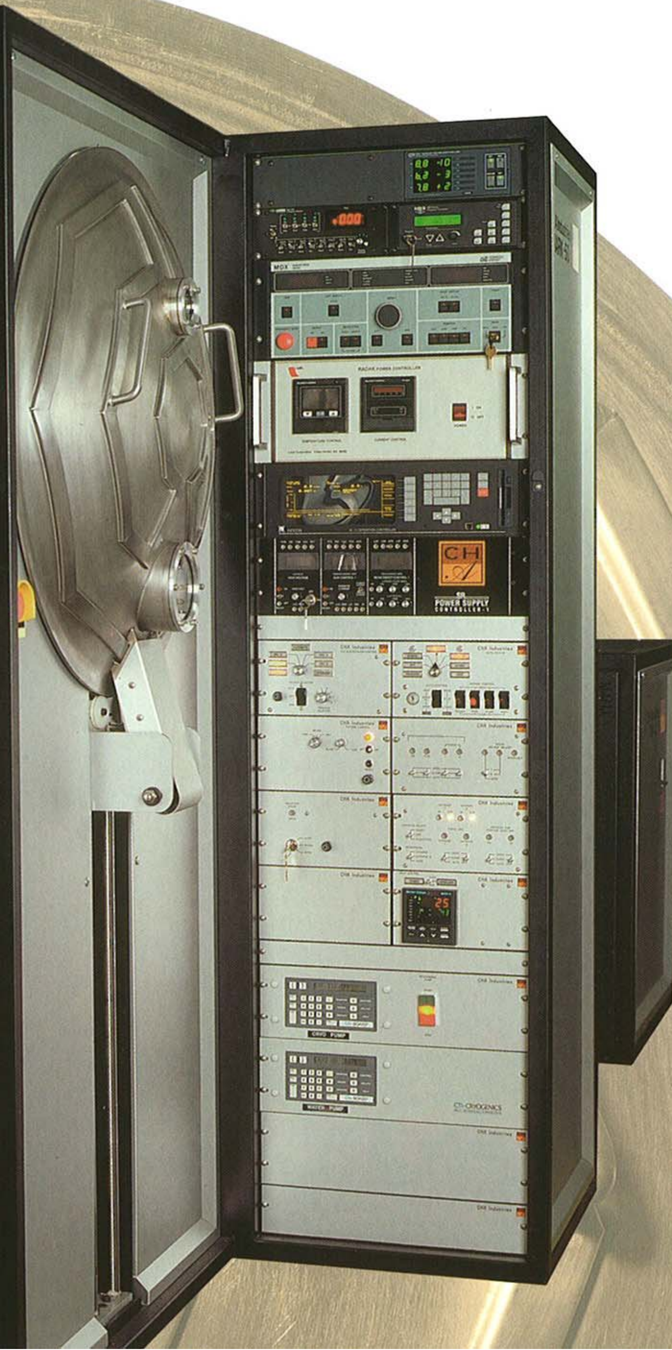
COMBINATION SPUTTERING AND EVAPORATION HIGH VACUUM DEPOSITION SYSTEMS

CHA Industries

INTRO

MARK 50 – THE CLASSIC HIGH VACUUM DEPOSITION SYSTEM THAT HAS ADVANCED WITH TODAY'S TECHNOLOGY...

CHA Mark 50 Systems are available with a wide range of options covering the spectrum from full computer control to manual operation, from production runs to small R&D quantities. They are economical, feature fast loading and unloading, offer broad process flexibility, and accommodate a variety of substrate sizes, shapes, and materials. Their efficiency of design, ease of operation, and unmatched reliability make them an excellent choice for a wide range of production applications.



MARK 40 SYSTEM

The CHA Mark 40 System is available for moderately sized production runs or R&D quantities. It is similar in design and operation to the Mark 50 System except that it is smaller in physical size. The Mark 40 System is available with virtually the same range of operating features and options as the Mark 50 System and has the same high quality of materials and construction.

DUCTION

CHA Mark 50 packs the versatility needed for special high-vacuum deposition tasks into a single, compact system. Whether your requirements are best met with sputtering or evaporation processing, the Mark 50 system offers the best of both worlds. It is equally productive in either process, and both processes can be accomplished in the same run (i.e., sputter a barrier metal (TiW) and overcoat with aluminum using an E-Beam source).

Mark 50 System shown equipped for web/roll coating applications

Mark 50 Systems can be configured for a wide range of applications. A broad selection of options from control systems to process stations to fixturing let you meet your specific requirements–without compromise. With the Mark 50, system components and controls are combined for an optimum mix of product cost, throughput and quality.

EASE OF

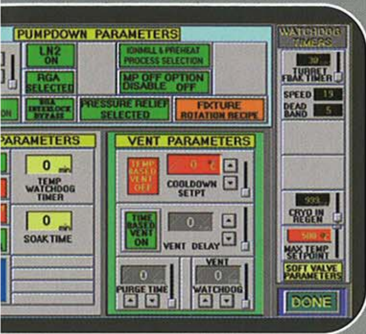
Ergonomically designed modules provide step-by-step control of deposition process.

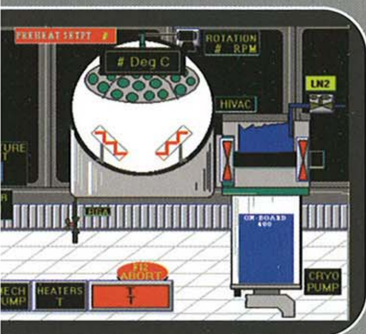
PROCESS CONTROL SYSTEM

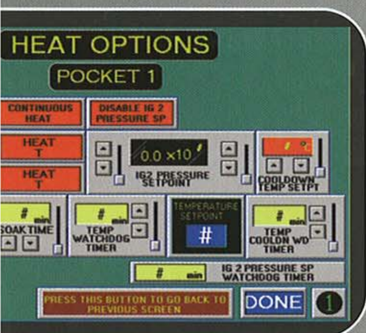
The entire air-to-air deposition process can be automatically controlled by either CHA's Siemens-based PLC/PC automation or by CHA's 1-Button Controller: both control systems permit fully-automatic cycling of the system valves, as well as providing multi-function, semi-automatic control for process development and maintenance-type functions. Separate process control and source control modules are mounted in electronic rack assemblies located in proximity to the deposition chamber. This allows process adjustments to be made as the process is observed.

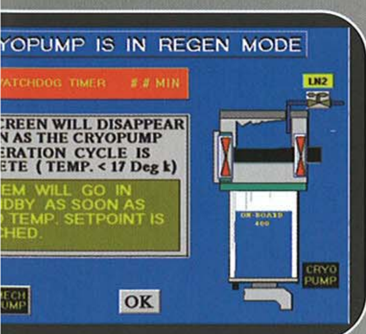
The optional PLC/PC-based control system automatically controls each step in the air-to-air process, as well as providing a real-time, interactive flat panel display of system and process status. DDE (Dynamic Data Exchange) is utilized between the process controller and the flat panel display. Visual and audible "pop up" screens keep the operator aware of system or process faults and include displays of suggested corrective action. The system computer employs the widely used Windows® and Windows NT-based WonderWare and Seimens S-7 software, making operation of the system extremely user friendly.

USE









Operation and programming access levels are controlled by password security. Programming data is entered from a disk, slideout keyboard, mouse, or screen function keys. Audible voice prompts are provided during operation and troubleshooting to assist the user. The prompts can be presented in either a male or female voice, as well as in a specified language. Provision can be made for closed-circuit video monitoring of source activity, and a bar code scanner is available for data entry and tracking or data logging. Stored process data is easily called up and displayed in spreadsheet format. If trouble-shooting assistance is required, data can be sent to the factory for analysis.

OPERATOR CONVENIENCE

The Mark 50 System incorporates a unique, patented slide-down door on the front of the chamber to minimize floor space requirements while providing ease of access. The system's process chamber and fixturing are ergonomically designed to minimize operator fatigue while maximizing efficiency. For added convenience, wafer loading automation is available, and a rear door is provided for greater flexibility for maintenance. The two doors permit total access to sources, shutters, shielding, and other fixturing components so they may be easily serviced. Front and side view ports allow the operator to observe the deposition process in progress.

CLEANROOM INSTALLATION

The space-efficient Mark 50 System is designed for ballroom or through-the-wall mounting to meet cleanroom requirements, while conserving valuable floor space. When the system is placed inside a cleanroom, The pumping stack and other associated equipment are closed off to meet cleanliness requirements. When in a through-the-wall configuration, the pumping stack and other associated equipment are easily accessible outside of the cleanroom for maintenance. Mated pairs of systems (right and left hand) can be provided.

Step-by-step monitoring and control of the deposition process is facilitated by the Mark 50's user-friendly display screens.

APPLICATIONS

CHA Mark 50 Systems have the versatility needed to perform in a wide range of applications. Their legendary performance has made them the system of choice in semiconductor fabrication plants around the world.

In addition to semiconductor processing, Mark 50 Systems are widely used for coating LEDs, MEMs, and MR/MGR heads, as well as a wide range of materials in the optical, ophthalmic, optical recording, magnetic media, medical, automotive, aviation, and metallurgical fields.

When configured with web roll fixturing, the system can be used for the processing of flexible substrates such as flat panel displays, solar cells, flexible printed circuits, electromagnetic shields, capacitors, and second-cell (rechargeable) batteries, as well as coating thin plastic and copper foil, ITO, AR film, magnetic tape, and consumer product packaging.

SYSTEM FUNCTIONALITY

CHA Mark 50 systems utilize moving substrates and precision process control for consistently high film uniformity, typically less than +/-5% across substrate, substrate to substrate, run to run.

For process flexibility, the Mark 50 can be used with up to three electron beam guns or any commercially available source including magnetron sputtering, thermal evaporation, ion beam, resistance, RF induction, and diode sources. Options include substrate heat, substrate preclean, ion beam etch, RF etch, and substrate bias (DC or RF). A range of shields and shutters are provided to ensure optimized processing and to enhance uniformity.

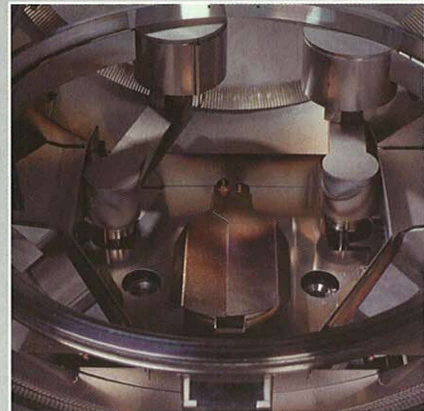
When configured for sputtering, the system is operated in the sputter up mode. Cathode-to-substrate spacing is adjustable, and all systems can incorporate multiple cathode stations, which may be utilized for sequential or co-deposition processing.

PROCESS CHAMBER

The Mark 50 system's 32 inch by 32 inch water cooled stainless steel process chamber incorporates an exclusive drop well design to accommodate a variety of deposition sources, shutters, heaters, and other process accessories.

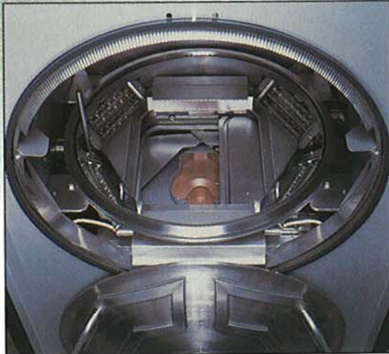
SUBSTRATE MATERIALS

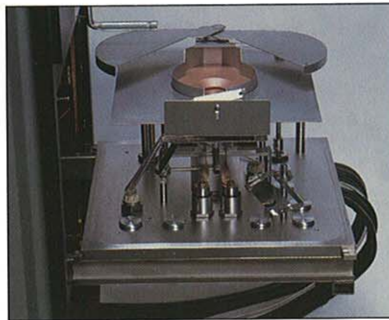
The system can accommodate a wide variety of substrate materials including silicon, ceramics, aluminae, copper, GaAs and other 3-5 compounds, polimides, Kapton, stainless steel, glass, mylar, and polyester.



EVAPORATION AND SPUTTERING SOURCES

CHA's 4-, 6-, and 8-pocket Electron Beam Guns are versatile and rugged enough for any job. Crucibles can be swapped in less than 30 minutes. To avoid overheating, the coils are surrounded by a water-cooled, solid-copper block. A complete range of Ion Beam Sources and CHA Sputtering Cathodes are also available.





LOAD LOCK SOURCE ISOLATION

The CHA Mark 50 Systems are available with a slide-out, load lock chamber designed to isolate the source(s) from the process chambers during operation. When equipped with this feature, the deposition system's process chamber can be independently pumped before exposing the process chamber to the source chamber. Predeposition processes, such as preheat, ion beam etch, and RF etch, can be performed in the process chamber while isolated from the source(s). This eliminates exposure of the source(s) to air, a major source of oxidation. The isolated source chamber permits substrate loading and unloading while the deposition sources are maintained under high vacuum. Conversely, substrates can be independently maintained under vacuum to prevent oxidation if a source must be accessed in the middle of a run.

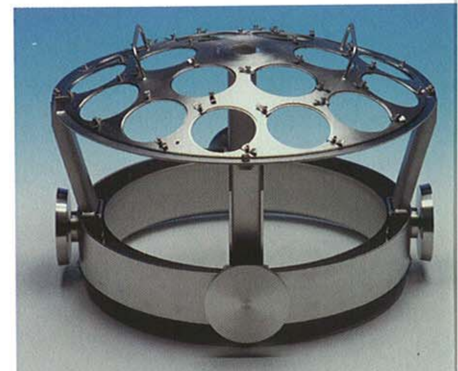
A computer-programmable, 6-axis industrial robot is available for loading of wafer substrates onto most types of Mark 50 system deposition fixturing. Automated dome loading is also available.

POWER SUPPLIES

CHA's SR-Series Electron Beam Power Supplies feature superior emission current regulation, unique gun-programming capabilities, and durability. Models provide five different outputs-3-4-6-10-15 KW. The output power may be used to supply a single EB Source, simultaneously power three sources in a single chamber, or independently operate a source in each of three chambers. Power supplies are also available for Sputtering, 1-3-5-15-30 KW; Heater, 6-10-16 KW; and Thermal deposition, 1-5-10 KW.

PLANETARY AND LIFT-OFF FIXTURING

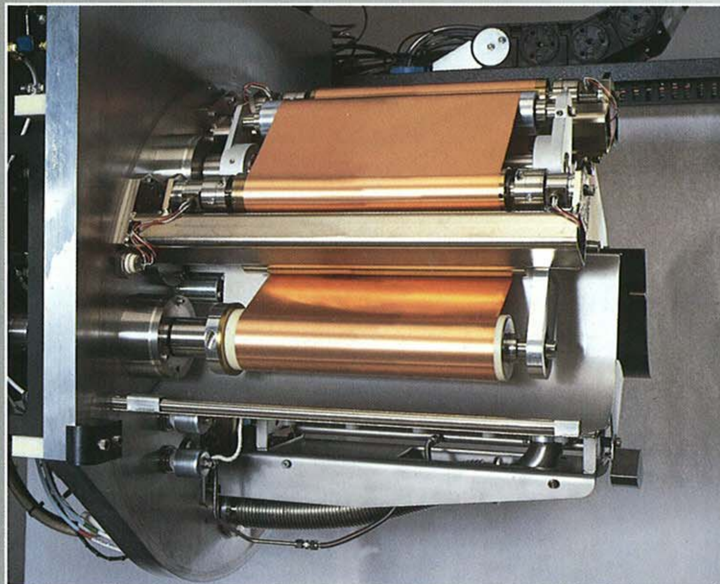
Mark 50 System features include the full range of CHA's renowned fixturing systems, including a variety of planetary (including Adjustable Angle), Lift-Off fixturing accommodating any wafer size including 6 inches is a "core" product for CHA. Replacement planetary fixturing is available for most manufacturer's types.



FUNCTIONALITY

WEB ROLL FIXTURING

When the Mark 50 is configured for coating *flexible* substrates, a roll of the substrate material is mounted on a computer controlled motor-driven web roll fixture, which is placed in the system's high-vacuum process chamber. The material is then fed past deposition sources at a speed controlled by a precision (digital) drive system, ensuring optimum throughput in a smoothly wound roll with high film uniformity.



The CHA Web/roll Fixture (above) feeds flexible substrate material past the deposition sources in the Mark 50 process chamber. The Web/roll Fixture is loaded and unloaded outside of the process chamber by means of an overhead trolley (left).

PUMPING STACK

CHA's patented 16-inch pumping stack is utilized in the Mark 50 system. The pumping stack combines four components, which are mounted to maximize pumping speed. This arrangement results in four times the inlet port speed of individually mounted components and uses 75% less space with one third the number of major vacuum-to-air seals.

The simple elegance of CHA's 16-inch stainless steel, high-vacuum valve ensures quality performance. It has the least moving parts than any valve in the industry, and its *vertical sealing* plane eliminates high vacuum leaks caused by falling particles–a common problem with horizontal gate and other types of poppet valves.

Pumping options include cryo, turbo, or diffusion pumps. A 50 cfm mechanical pump is provided for roughing the process chamber and backing the high-vacuum pumping stack components. Mechanical pumps with higher cfm ratings are available. Pumps, pump fluids, and filters are available for corrosive gases if required by process parameters.

CHA's renowned right angle pumping/plumbing design provides extremely high-efficiency pumping performance in the Mark 50 and other CHA systems.

FEATURES

FOR MARK 50 AND MARK 40 SYSTEMS

Each system is individually configured to meet specific customer requirements. System components and controls are combined for an optimum mix of product cost, throughput, and quality.

- **Dual operation, sputtering and evaporation**
- **Moving substrates**
- **Film uniformity (fixture dependent), 5%**
- **Sputter up**
- **Process stations**
  - — Round cathodes, RF or DC: up to 4 stations
  - — Co-deposit
  - — Bias, RF or DC
  - — Substrate heating, 400°C, multi-element
  - — Substrate heating, station
  - — Electron beam
  - — Thermal
  - — Sputter etching
  - — Ion beam preclean/etch
  - — Plasma texturing/etch
- **Power supply options**
  - — Electron beam, 3-6-10-15 KW
  - — Sputtering, 1-3-5-15-30 KW
  - — Heater, 6-10-16 KW
  - — Thermal deposition, 1-5-10 KW
- **Process chamber**
  - — Insitu spectrophotometer
  - — Video/closed circuit monitoring of source activity
  - — Drop well source
  - — Easy access to front and rear door
  - — Variable source-to-substrate distance
  - — Variable port locations, observation port(s) and RGA port
  - — Source isolation
  - — Automatic wafer loading/unloading
  - — Web roll coating
  - — Web roll loading/unloading trolley
  - — Process chamber dimensions
    - Mark 50: 32" x 32"
    - Mark 40: 26" x 26"
- **Deposition fixturing**
  - — Adjustable angle planet, standard
  - — Vertical drum with pallets, standard
  - — Rotating disk, optional
  - — Rotating dome, optional
  - — Flat planetary, 3 or 4, optional
  - — Web roll with precision drive
  - — Shutter(s), flag
  - — Trackless planetary dome
  - — Lift off
  - — Planetary dome
- **Pumping stack**
  - — Dry or oil sealed roughing
  - — Regeneration options
  - — Famous right angle pumping/plumbing
  - — Unsurpassed pumping performance
  - — High vacuum valve, *vertical seal*, 16"
  - — Foreline and roughing valves, *vertical seal*, 3"
  - — Large capacity vapor pumping options
  - — Mechanical pump, minimum CFM
  - — Molecular sieve trap
  - — Cold trap LN2, pump trap, 25"L
  - — LN2 level control
  - — Ionization gauge control
  - — Gas controls
- **Pumping options**
  - — Cryo
  - — Turbo
  - — Diffusion
- **Ultimate vacuum**
  - — System 10^{-9} Torr
  - — Chamber 10^{-8} Torr
  - — 10^{-7} Torr in less than 25 minutes
- **Cryo coil**
  - — 50,000 L/Sec. pumping speed for water vapor and other condensable gases in the process chamber.
- **Utilities**
  - — Water supply, 3 GPM
  - — Air supply, 85-125 psig
- **Footprint**
  - — Mark 50: 81.5" W x 55"D x 78.5"H (with ISO source add 21"H)
  - — Mark 40: 76"W x 55"D x 78.5"H (with ISO source add 21"H)

CHA THE RIGHT CHOICE...

OUR COMMITMENT

CHA Industries has been serving domestic and international customers for over 40 years. Our commitment to quality, reinforced by comprehensive testing at all stages in the manufacturing cycle, ensures that all product performance standards are consistently met.

APPLICATIONS ENGINEERING

CHA's expert staff of application engineering specialists are available to assist customers in the selection of the right equipment for their needs. Customers can draw freely on CHA's many years of experience working with a wide variety of installations around the world in various demanding, technical applications.

CUSTOMER SERVICE

Factory service personnel are available to assist in performing process functions and troubleshooting. Computer data from production runs and tests can be sent to the factory for analysis.

CHA PRODUCTS

- **High vacuum deposition systems, evaporation and sputtering**
- **Production box coaters**
- **Sources**
- **Fixturing**
- **Heaters**
- **Power supplies**
- **Other deposition accessories**

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