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BELL-JAR THERMAL EVAPORATION SYSTEM

Bell-Jar Thermal Evaporation System - ToronEva™ Bell Jar

ToronEva™ Bell Jar is a fully automated bell-jar thermal evaporation system for thin film deposition in research and development laboratories. Resistive heating in a high-vacuum environment produces metal, oxide, and organic thin films at base pressures reaching 10^{-7} Torr. Panel control, quick cycle times, and adjustable source-to-substrate distance simplify operation while conserving evaporation material. The system handles 4-inch wafers, 1×3-inch lamellae, and various substrate sizes, adapting easily to changing deposition requirements.

A turbomolecular and mechanical pump combination, fitted with SS316 flex hose and a dust filter, reaches 10^{-6} Torr in under 30 minutes. The vacuum range spans 1000 to 10^{-9} Torr with automatic vent, back-fill, and chamber-hold capability. The bell jar is available in Pyrex glass or SS304, and the 75×120 cm footprint with lockable wheels fits through a standard 85 cm doorway. A closed-cycle water cooler with automatic on/off control manages heat load during extended deposition runs.

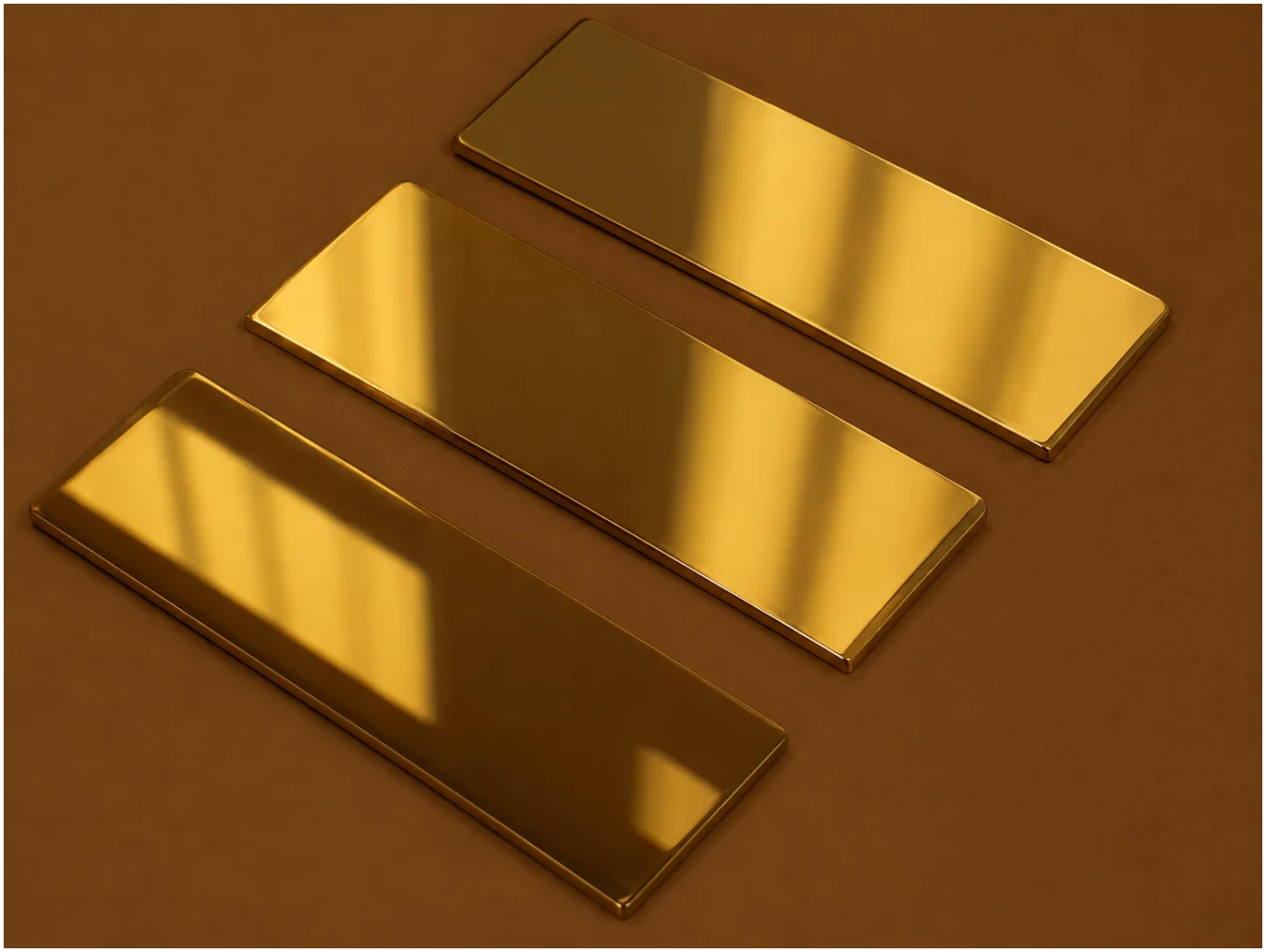
The ToronEva™ Bell Jar supports sequential and co-evaporation configurations with an optional four-source layout for 4×1 sequential or 2×2 co-evaporation. A servo-controlled shutter serves two thermal sources simultaneously, and a dual-channel thickness monitor with one QCM tracks deposition rate and cumulative film thickness in real time. Proprietary source-chamber geometry prevents cross-contamination between materials, preserving film purity across consecutive runs. Sample rotation at 2 to 30 rpm promotes deposition uniformity across the substrate surface.

APPLICATIONS

Bell-Jar Thermal Evaporation System - ToronEva™ Bell Jar Applications

The ToronEva™ Bell Jar serves thin film deposition requirements across research institutions, university laboratories, and specialized industrial facilities where a laboratory vacuum coater is needed for controlled thin-film work. Its versatile chamber configuration and multiple sample holder options make it suited to a wide range of substrate types and deposition materials.

- **Academic and University Research**: deposition of metals, oxides, and organic films for fundamental materials science and device physics studies in campus laboratory settings
- **Semiconductor Device Fabrication**: formation of metal contacts, gate electrodes, and dielectric layers on silicon wafers for transistor and IC prototype development
- **Optical Thin Film Research**: deposition of reflective and anti-reflective coatings on glass and crystal substrates for photonics and optical component development
- **Organic Electronics and OLED Research**: controlled deposition of organic and metallic layers for organic photovoltaic cells, OLEDs, and thin-film transistor prototypes
- **MEMS and NEMS Fabrication**: metallization and functional film deposition for microelectromechanical and nanoelectromechanical device development
- **Solar Cell Research**: deposition of contact layers and absorber films for laboratory-scale photovoltaic cell prototyping and efficiency studies
- **Materials Science and Surface Engineering**: thin film characterization studies requiring precise control of film thickness, composition, and deposition rate



CAUTION
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ToronEva™ Bell Jar
Bell-Jar Thermal Evaporation System
MAIN POWER
HIGH VACUUM PUMP

FEATURES

Bell-Jar Thermal Evaporation System - ToronEva™ Bell Jar Key Features

The ToronEva™ Bell Jar combines high-vacuum performance with a feature set oriented toward reproducibility, contamination control, and operational simplicity in research laboratory environments.

- **Fully Automated Vacuum Management**: panel control with quick cycle times reduces operator steps and preparation time between consecutive deposition runs
- **Pyrex Glass or SS304 Bell Jar**: operator selects chamber material to match process chemistry, with standard 1-inch ports for flexible feedthrough integration
- **Versatile Sample Holder Selection**: accommodates 4-inch wafers, 1×3-inch lamellae, and small-to-large samples with straightforward loading
- **Adjustable Source-Substrate Distance**: optimizes deposition angle and rate distribution by repositioning the source relative to the substrate without chamber modification
- **SS304 Internal Protection Jacket**: shields the chamber interior from direct evaporant exposure, extending service intervals and simplifying post-deposition cleanup
- **10^{-7} Torr Base Pressure with Fast Pump-Down**: reaches 10^{-6} Torr working pressure in under 30 minutes, reducing cycle time in multi-run sessions
- **Turbomolecular and Mechanical Pump Stack**: paired pumps with SS316 flex hose and dust filter provide clean, low-contamination vacuum across the full operating range
- **Wide-Range Vacuum Control (1000 to 10^{-9} Torr)**: integrated control and measurement system with automatic vent and back-fill eliminates manual valve operation
- **Integrated Closed-Cycle Water Cooler**: automatic thermal management activates and deactivates cooling as needed, protecting the system during continuous operation
- **Optional Four-Source Configuration**: supports 4×1 sequential or 2×2 co-evaporation for alloy, compound, or multilayer film deposition in a single pump-down cycle

- **Power-Failure Auto Shut-Off with Vacuum Hold**: shuts down safely on power loss and maintains chamber vacuum to protect samples and preserve the deposition environment
- **2000 W Thermal Evaporation Power Supply**: 10 V to 200 A output range accommodates low-melting organics and high-temperature metals in a single unit
- **Cross-Contamination Elimination Design**: proprietary source-chamber geometry prevents evaporant cross-contact between sources and chamber walls, preserving material purity
- **Dual-Channel Thickness Monitor with QCM**: real-time monitoring of deposition rate and cumulative film thickness across two independent sources simultaneously
- **2 to 30 rpm Sample Rotation**: adjustable substrate rotation distributes vapor flux uniformly, improving film thickness homogeneity across the substrate area
- **Servo-Controlled Dual-Source Shutter**: a single shared shutter with servo actuation controls deposition initiation and termination for both thermal sources simultaneously
- **One-Touch Vent Control**: a single button initiates the automatic vacuum management sequence, simplifying chamber access without stepwise manual procedures
- **Operator-Friendly Interface**: intuitive control layout with a clear display reduces the learning curve for new users and speeds up daily laboratory operation
- **Compact Mobile Platform**: 75×120 cm footprint on lockable wheels provides stable positioning while allowing the system to be relocated within the laboratory
- **Standard Doorway Clearance**: the system passes through a standard 85 cm doorway, removing installation and relocation barriers in buildings with conventional corridor widths
- **One-Year Full Warranty**: coverage for design, materials, and workmanship gives laboratories confidence in long-term reliability and manufacturer accountability

THEORY & METHOD

Theory and Method

Thermal evaporation deposits thin films by heating a source material inside a high-vacuum chamber to its vaporization point. A high-current, low-voltage power supply drives electrical current through a resistive source such as a tungsten boat, coil, or basket. Vaporized atoms travel in straight lines through the vacuum and condense on substrate surfaces positioned above the source. At pressures below 10^{-5} Torr, residual gas molecules are too sparse to scatter vapor atoms, producing high-purity films.

The vacuum system determines film quality as much as the source material itself. A turbomolecular pump backed by a mechanical pump evacuates the chamber to base pressures below 10^{-7} Torr, reducing residual gas contamination to negligible levels. Automatic vent and back-fill functions let the operator cycle the chamber without manual valve operations, and a hold-vacuum mode maintains the environment between depositions. The 2000 W (10 V to 200 A) power supply accommodates both low-melting organics and high-temperature refractory metals in a single unit.

A dual-channel deposition controller and a quartz crystal microbalance (QCM) monitor film thickness in real time. As film mass accumulates on the oscillating QCM crystal, the resonant frequency shifts in proportion to the deposited thickness, a relationship derived from the Sauerbrey equation. The controller converts that frequency shift to a thickness reading continuously without interrupting deposition. Sample rotation at 2 to 30 rpm distributes vapor flux evenly across the substrate, improving uniformity.

TECHNICAL SPECIFICATIONS

Bell-Jar Thermal Evaporation System - ToronEva™ Bell Jar Technical Specifications

Parameter	Specification
Thermal Evaporation Power Supply	2000 W (10 V – 200 A)
Base Pressure	10^{-7} Torr

Parameter	Specification
Working Vacuum Level (Pump-Down Time)	10^{-6} Torr in ≤30 minutes
Vacuum Control Range	1000 to 10^{-9} Torr
Pump Configuration	Turbomolecular + Mechanical
Pump Hose	SS316 flex hose with dust filter
Bell-Jar Material	Pyrex glass or SS304 cylinder
Bell-Jar Ports	Standard 1-inch
Internal Protection Jacket	SS304 cylindrical
Sample Holder Options	4-inch wafer; 1×3-inch lamellae; small and large samples
Source-to-Substrate Distance	Adjustable
Sample Rotation Speed	2 to 30 rpm
Thickness Monitoring	Dual-channel thickness monitor + one QCM
Standard Number of Thermal Sources	2
Optional Source Configuration	4 sources (4×1 sequential or 2×2 co-evaporation)
Shutter	Servo-controlled, common to two thermal sources
Cooling System	Closed-cycle water cooler (automatic on/off)
Vacuum Management Functions	Automatic vent, back-fill, and chamber-hold
Footprint	75 × 120 cm
Door Clearance	Passes through standard 85 cm doorway
Mobility	Lockable wheels
Warranty	1 year (design, materials, and workmanship)

TORONTECH.com

TORONTECH

Torontech Inc.
251 Consumers Road, Suite 1200
Toronto, Ontario, M2J 4R3, Canada

Phone: +1 416 368 2721 | Fax: +1 416 981 7652
Email: info@torontech.com

Torontech, LLC
601 Brickell Key Drive, Suite 700
Miami, FL 33131, USA

Toll-Free: 1-866-383-7919
Email: sales@torontech.com

Torontech ME FZE
Meydan Grandstand, 6th Floor,
Meydan Road, Nad Al Sheba,
Dubai-261440, UAE

Phone: +971 488 19252
Email: me@torontech.com

USA | Canada | EU | UAE | GCC | KSA | India | Africa | Latin America | Asia