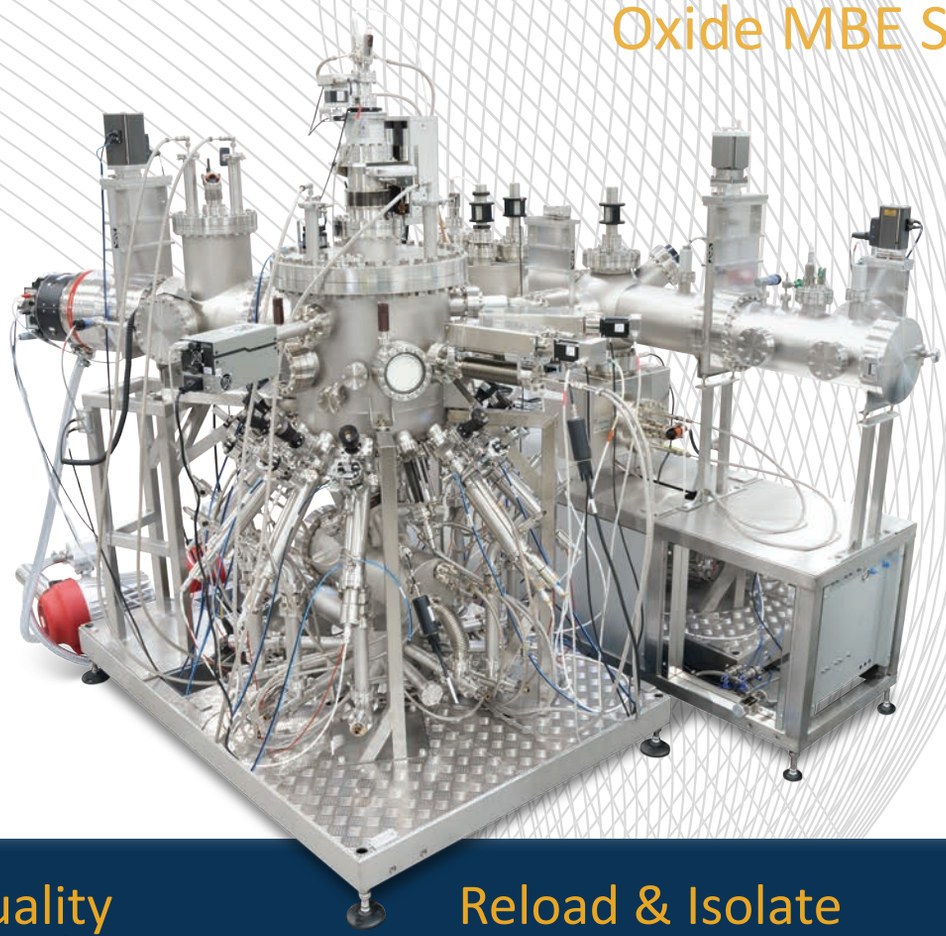
R-Series

Oxide MBE Systems



Highest-quality Oxide-Growth

By molecular, atomic, ozone and hybrid MBE

Reload & Isolate

Source material without venting

Highly Versatile

With unbeaten source flexibility

Optimised System Efficiency

Up to 4“ substrates

The **DCA R-Series Oxide MBE delivers atomic-scale control** of composition, interfaces, and strain-enabled by stable fluxes, shuttered growth, and ozone-based oxide operation, unlocking high-quality materials from photonics to superconducting quantum oxides.

DCA

I N S T R U M E N T S

DCA is the recognised leader in oxide Molecular Beam Epitaxy (MBE),

with **extensive expertise** and the **trust of a large customer base** across the field, we understand that research into **next-generation ferroelectrics**, **quantum materials**, **superconductors**, and **integrated photonics** demands **innovative processes** and **customised solutions**. Through the **latest generation** of our **R450** and **R600 platforms**, we are **committed** to **delivering unique solutions** for **challenging material applications**.

Customer References
Innovative. Reliability

Dr Gideok Kim and Dr Gennady Logvenov
Max Planck Institute for Solid State Research, Germany.

The DCA oxide MBE system, installed in 2012, has consistently met expectations, performance, reliability, and efficient thin-film synthesis. DCA's expertise, responsive technical support, and dependable maintenance services have ensured smooth operation, making the system easy to use and highly reliable over the long term.

Dr. Guillaume Saint Girons
Institut des Nanotechnologies de Lyon, France.

Installed in 2024, the DCA oxide MBE system has delivered reliable performance for the growth of advanced oxide thin films, including **BTO**. DCA's expertise and responsive support enabled rapid commissioning, while the system's reliability and ease of use have supported efficient operation and consistent, high-quality thin-film growth.

Combining ultra-stable flux control, shuttered layer-by-layer growth, and reactive ozone capability, the DCA R-Series Oxide MBE enables precise stoichiometry, abrupt interfaces, and strain engineering; driving breakthroughs from in-situ monitored 2D materials to high-Tc oxide superconductors.

Application Highlights

Design of Complex Oxide Interfaces by Oxide MBE.

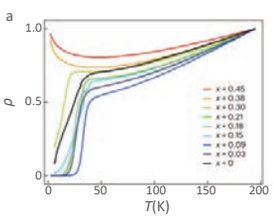
In-situ control & growth diagnostics - $PtSe_2$ (in-situ ellipsometry).
https://doi.org/10.1116/6.0004406

Interface & substrate engineering - Bi_2Se_3 (substrate preparation).
https://doi.org/10.1116/6.0004429

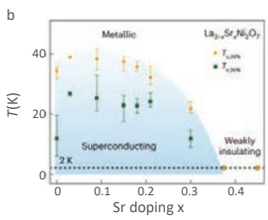
Flux/temperature precision.

Frontier oxide/quantum materials - Nickelate superconductors.

Proposed phase diagram of La3 - xSrxNi207 thin films

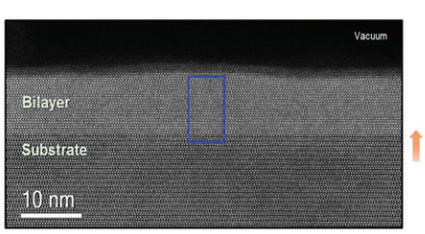


App-Figure 1: a) Temperature dependence of resistivity (normalised at 195 K) for the representative samples with various Sr doping levels x.

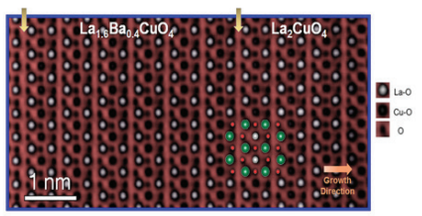


App-Figure 2: b) Doping-dependent superconducting phase diagram of La3–xSrxNi2O7 thin film. Circles (squares) represent the average Tc,98% (Tc,50%) of each doping level, defined as the temperature at which the resistivity reaches 98% (50%) of the extrapolated normal-state resistivity, linearly fitted above the superconducting transition. The error bars mark the range of observed Tc,98% (Tc,50%) values in different samples.

https://doi.org/10.1038/s41563-025-02327-2



Low-magnification STEM-HAADF image taken from the LBCO-LCO bilayer reveals the long-range structural quality of the sample.



Superposition of simultaneously acquired STEM-HAADF and STEM-ABF images visualizing all atomic columns along this projection, from which the interatomic O-O distances are quantitatively measured.

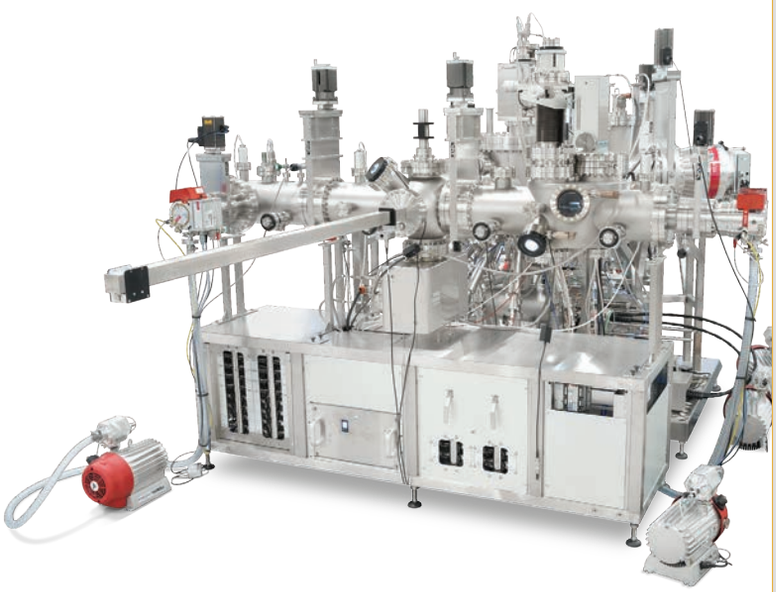
https://doi.org/10.1007/s10948-019-05285-4

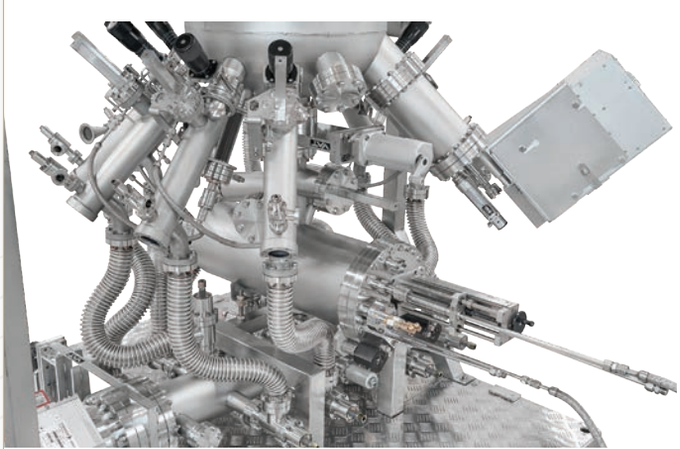
Accelerate your breakthroughs in Oxide MBE

Unlike traditional MBE platforms, the R-Series enables source servicing and replenishment without venting the growth chamber, maximising uptime and minimising contamination risks. Extensive diagnostic integration, including RHEED, pyrometry, QCM, and residual gas analysis, gives researchers complete visibility and control throughout the growth process.

Why choose the DCA R450 and R600?

- **Purpose-built** for Oxide and Hybrid MBE
- **Differentially pumped** effusion cells for complex materials systems
- **Innovate** with the MOPI source for Hybrid MBE
- **Ozone, plasma, and molecular oxygen** compatibility
- **Source replenishment** without breaking UHV
- **Comprehensive** in-situ diagnostics
- **Compact footprint** with world-class performance
- **New AI enabled** integrated control integrated control, safety interlocking, and automation software with data logging and recipe control





The R-Series is no ordinary MBE system

It is a platform designed to help researchers move faster, explore further, and achieve results that were previously out of reach.



Specifications

		R-Series	
DCA System		**R450**	**R600**
Sample size		up to 3”	up to 4”
Base pressure		< 3 x10^{-11} Torr	< 3 x10^{-11} Torr
Chamber size		450 mm with LN_2 cryopanel	600 mm with LN_2 cryopanel
Source ports	**Effusion cells**	10 x DN40CF	10 x DN63CF
	RF Plasma source	1 x DN63CF	1 x DN100CF
	E-beam evaporator	1 x DN100CF	1 x DN100CF
Pumping configuration		Turbo molecular pump and cryo pump	
Analytical ports		RHEED source (DN40CF), RHEED screen (DN100CF), RGA (CF40), QCM (DN63CF), BFM (DN63CF), Pyrometer (DN63CF), Ellipsometry (optional 2x DN40C), Atom Absorption (optional 2x DN16CF)	
Auxiliary ports		Viewport (DN100CF) with Shutter	
Bakeout temp		200°C	
Substrate manipulator		Thermal uniformity ± 3.0°C over 3” wafer@ 700°C excluding the 5mm edge. 1000°C Maximum substrate temperature (UHV, measured with a pyrometer). 900°C Maximum TC temperature (@ 5E^{-5} Torr). Maximum rotation: 60 rpm	
Main substrate shutter		Top Flange mounted, rotary motion (electro-pneumatic)	
Gas injection		RF Plasma source, ozone generator with gas injector, MOPI source	

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QUALITY SYSTEM CERTIFICATION DNV ISO 9001

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Proven Thin Film Technology for Demanding Materials

DCA INSTRUMENTS