



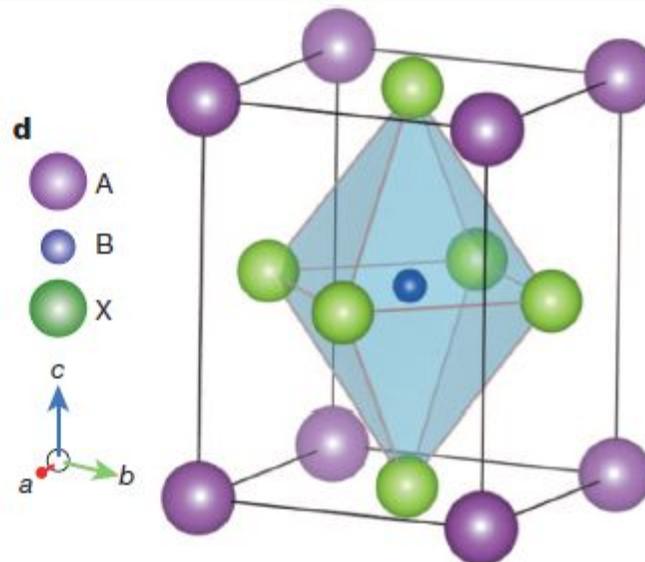
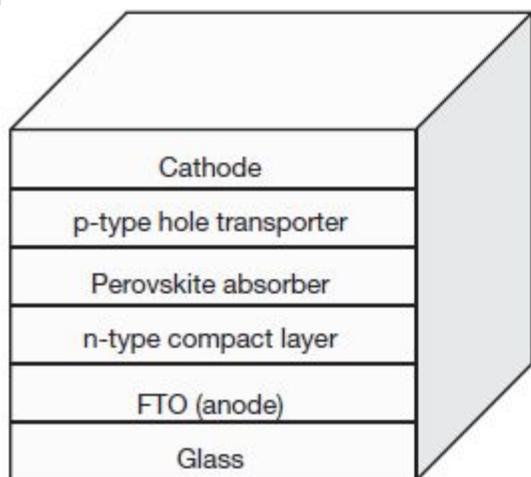
RIBER
Hybride – Perovskite

INNOVATIVE SOLUTIONS FOR SEMICONDUCTOR INDUSTRY

RIBER

RIBER ADDON VG SEMICON

Perovskites structure



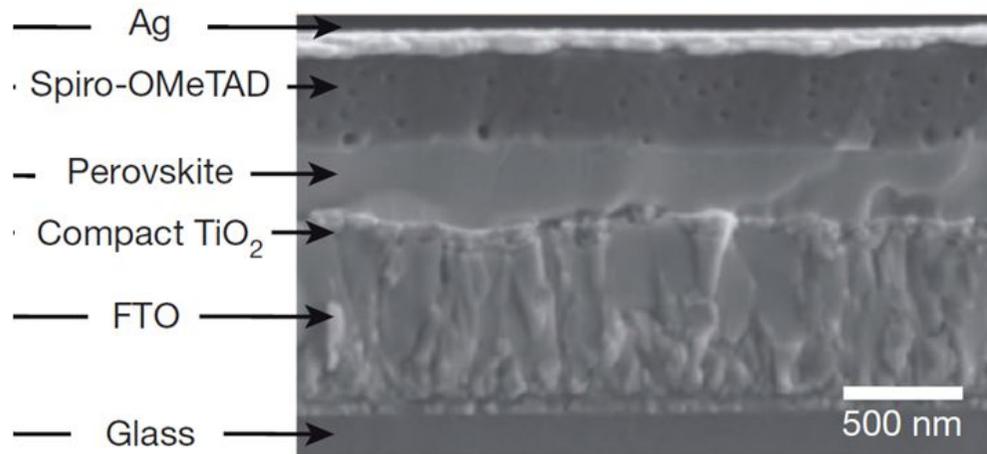
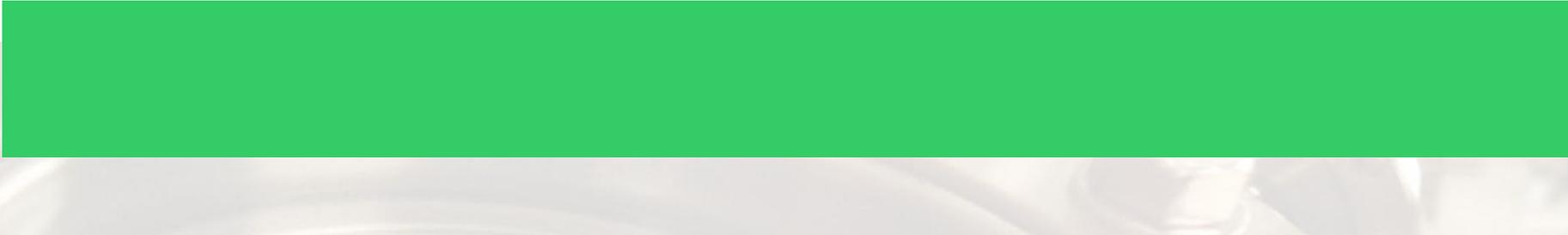
A : methyl Ammonium
 B : Pb
 X : I or Cl



Structure	Thickness (nm)	function	Material	Method
Metal	20	Cathode	Ag	Evap
p-type	400	Hole collection layer	spiro-OMeDAD	Evap
Perovskite	400	Absorbing layer	organometal trihalide ((RNH ₃)BX ₃) R=C _n H _{2n+1} B=Pb,Sn X=I,Br,Cl	Co-Evap
n-type	20	electron collection layer	TiO ₂ : Al	
FTO	600	Anode	SnO ₂ : F	Sputtering

Evaporation sources for high performance PV

Sources	Matériaux	Molar ratio
Organic 1	methylammonium iodide (CH ₃ NH ₃ I)	4
Inorganic Compound	PbCl ₂	1
Organic 2	spiro-OMeDAD	1
Inorganic	Ag ou Ag:Mg	1 ou 1:10



M. Liu, M.B. Johnston & H.J. Snaith, Nature 2013

Structure	Material	Coating method
Cathode	Ag	Evap. / sputtering
Hole transporter	Spiro-OMeDAD	Evap. / spin-coating
Perovskite absorber	(RNH ₃)BX ₃	Co-Evap
Selective electron contact	Doped TiO ₂	Sputtering
Anode	FTO	Sputtering
Substrate	Glass	

Hybride-Perovskite growth

Double cell on CF63 : RIBER offer

MINICELL TECHNOLOGY DOUBLE CLUSTER CELL-DCC

BOOST YOUR SYSTEM CAPABILITY

- Compact thermal evaporation cell
- Two cells on one port – cluster cell design
- 80 - 1600°C operating temperature range
- Integrated water shielding and shutter
- Perfect for spintronics applications

The Riber Minicell is a **small capacity** effusion cell integrating water shielding and shutter. The large variety of crucibles and liners, ease of use and flexibility make the Minicell the most versatile effusion cell.

The **Double Cluster Cell** integrates **two Minicells**. The double effusion cells are fitted on a DN63CF Flange (4.5"). Each cell has an **individual water shield and a shutter mechanism**.

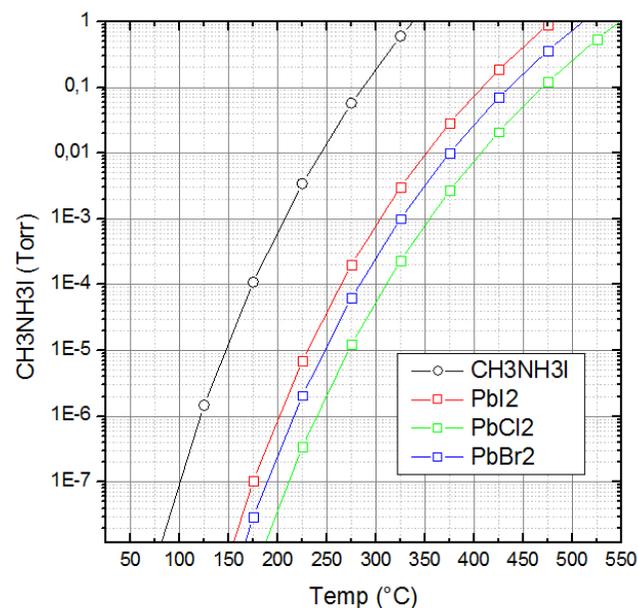
The two cells can be **operated independently** from each other.

The water shield surrounding each cell **minimizes the temperature cross talk** between the effusion cells.

The thermal separation of each cell allows the use of the DCC with metals of **different evaporation temperatures without any risk of cross contamination**.

The DCC can be advantageously used on MBE system (ex: C12 - C21) as a **dopant cell like Silicon (n-type) and Mg (p-type)** for example.

The design, construction material and process, cleaning and tests are the same stringency as for MBE components, providing **high purity and quality thin films in a clean HV - UHV environment**.



- Ideal for the growth of hybride perovskites
- Dual Shutter and individual water cooling
- No cross talk between low temperature organic and Lead halides evaporation
- Also compatible for stanic iodide based perovskite (SnI4)

Hybride Perovskites Full control

Halides composition management

Four cluster cell – FCC

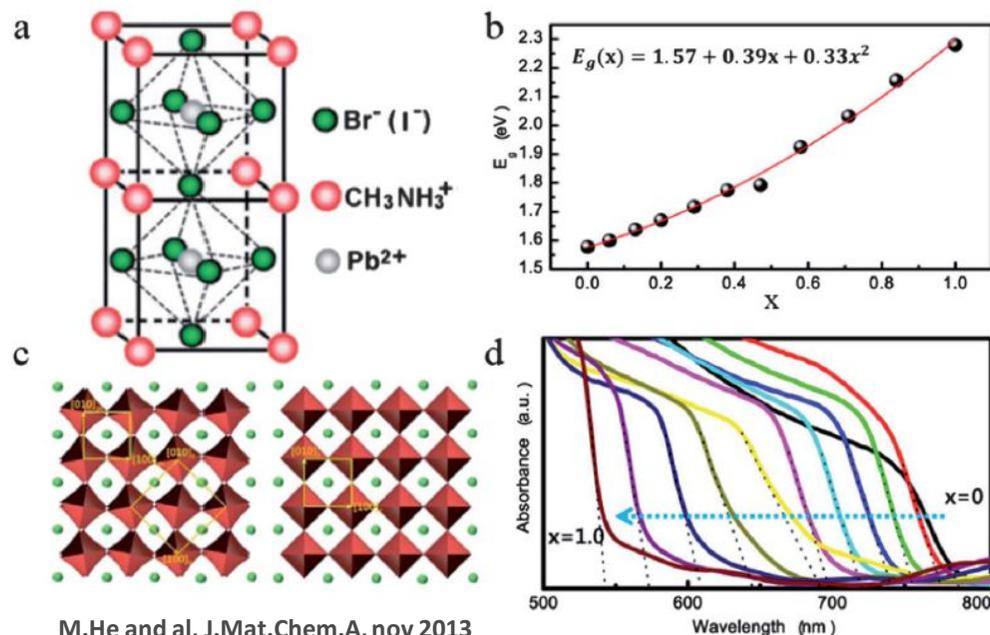
Enables Spintronics, Ni, Fe, Co, M, etc.

- Ideal for Surface and Material science research
- Four individual Effusion Cells on DN63CF
- Integral water shielding and individual shutters
- Large choice of Liners and Crucibles
- 80°C – 1600°C operating temperature

The MiniLab cell integrates **four Minicell ovens** on a DN63CF (4.5").

Each of the cell has its **own shutter mechanism**. The four cells are **thermally shielded** from each another. **Baffles** in between the cells and an **integral water shield** surrounds the cluster cells contributing to minimize the cross talk between the effusion source. **The thermal separation** of each of the sources allows using the four cells with metals, with different evaporation temperature.

This tool is dedicated to prospective research projects on material properties. The versatility and flexibility of this technology allows **fast and efficient** systematic studies on spintronics, OLED, etc.



- Co evaporation PbI_2 , $PbBr_2$ and CH_3NH_3I allows fine tuning of the gap of the hybride perovskites
- Minilab allow the deposition of absorbing and p-type transport layer
- Ideal for research lab
- Cost effective solution

Boost the Hybride-Perovskite Research

Compact effusion cell

CELLS AND SOURCES

MINI CELL: MIC 19

Dedicated for material vaporization in a range from 80°C To 1600°C



- Flexible small dimension effusion cell (DN40CF)
- Compatible with any deposition system
- Rugged and reliable for a lifetime
- Extendable through a cluster of cells

The Minicell is a **small capacity (1-12cm²)** effusion cell compatible with any commercial or homemade deposition system. The Minicell technology **integrates a compact oven** (heating element made of tantalum + thermocouple). **The contact thermocouple** senses the temperature at the bottom of the crucible allowing **precise reproducibility of the deposition rate**. It integrates also a **water shielding** and is equipped with a **pneumatic shutter** allowing the **deposition of sub monolayer control**. The Minicell is dedicated for the vaporization of materials in a range from **80°C to 1600°C**.

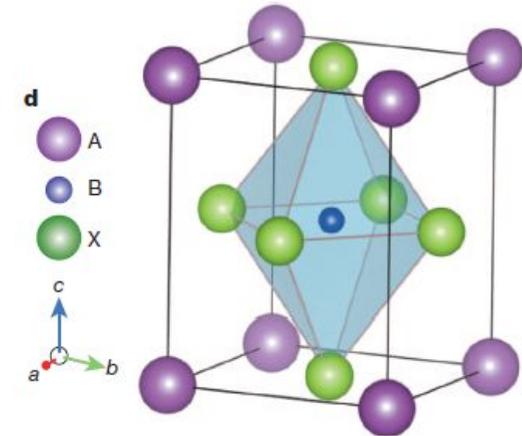
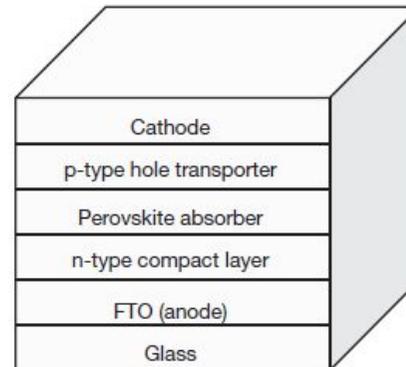
It's **large variety of crucibles and liners**, it's easy to use and its flexibility brings the Minicell as **the most versatile effusion source for small scale research systems**. The choice of crucibles or liners made of various material (pBN, PG, Al₂O₃, W, Ta, etc.) allows to evaporate almost all metals and compounds in a range from 80°C to 1550°C.

It's design, construction material and process, cleaning and tests are performed with the same stringency as for MBE components and allow performing high purity and quality thin films in a clean HV _ UHV environment.

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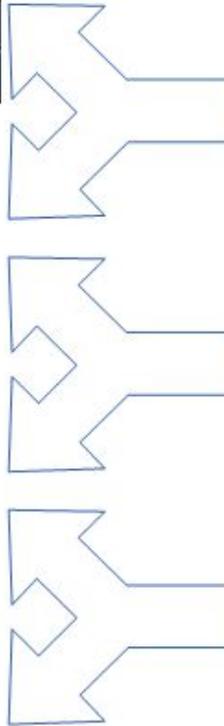
C : I or Cl

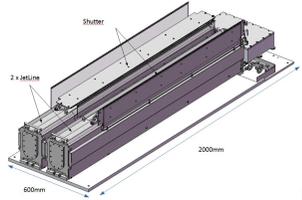


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- ❑ Co evaporation PbI₂, PbBr₂ and CH₃NH₃I allows fine tuning of the hybride Perovskite absorber
- ❑ Spiro-OMeDAS control thickness and quality
- ❑ Allows the growth of the Ag/Mg or LiF/Al cathode
- ❑ Installable on any PVD system
- ❑ Cost effective solution

Product line for mass production



Product Line	
ORGA JET	
JET Se	
JET Line	
VULCAN S63 VULCAN S150 VULCAN S250	

