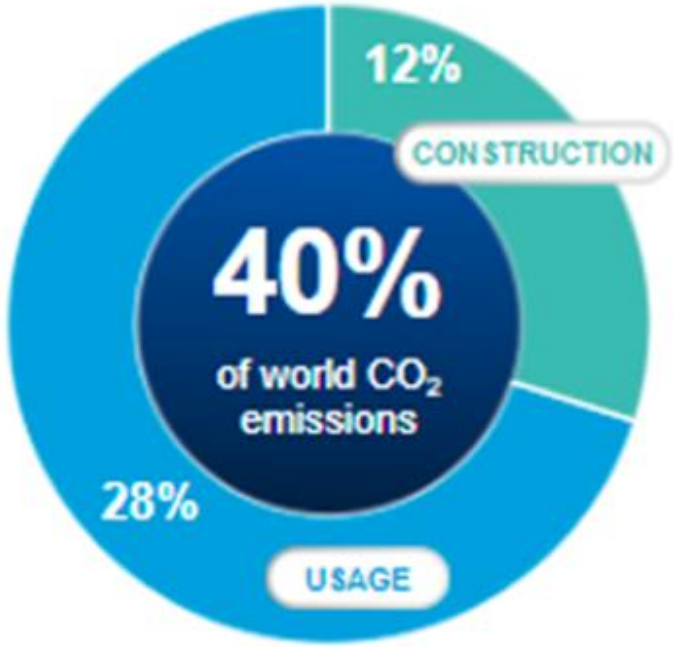
Glass in Sustainable Construction

EMMANUELLE GOUILLART
SAINT-GOBAIN

Building sector environmental impact



Embodied carbon (production, construction)

&

Operational carbon (usage: heating, cooling, …)

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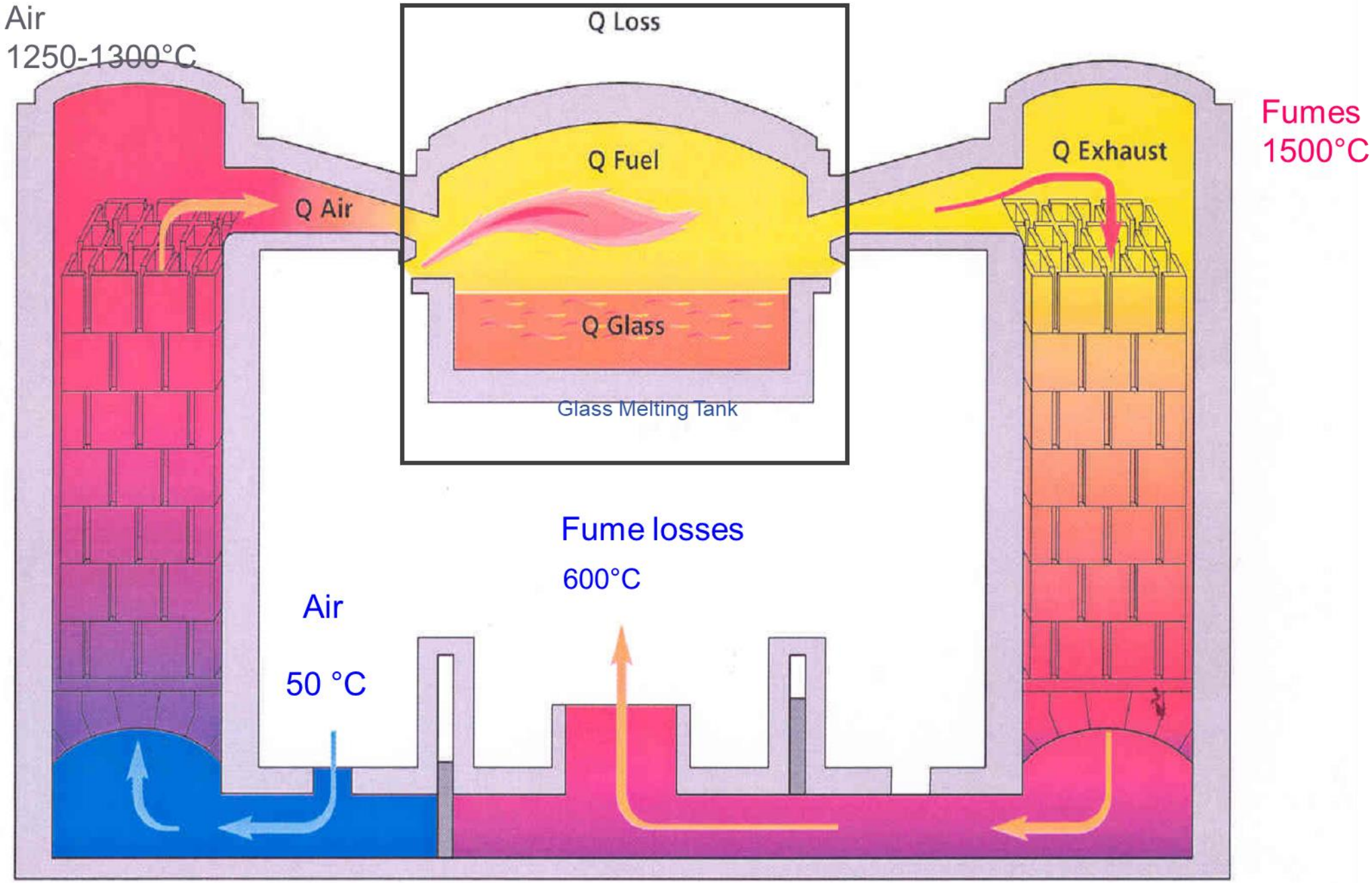
1/3


2/3

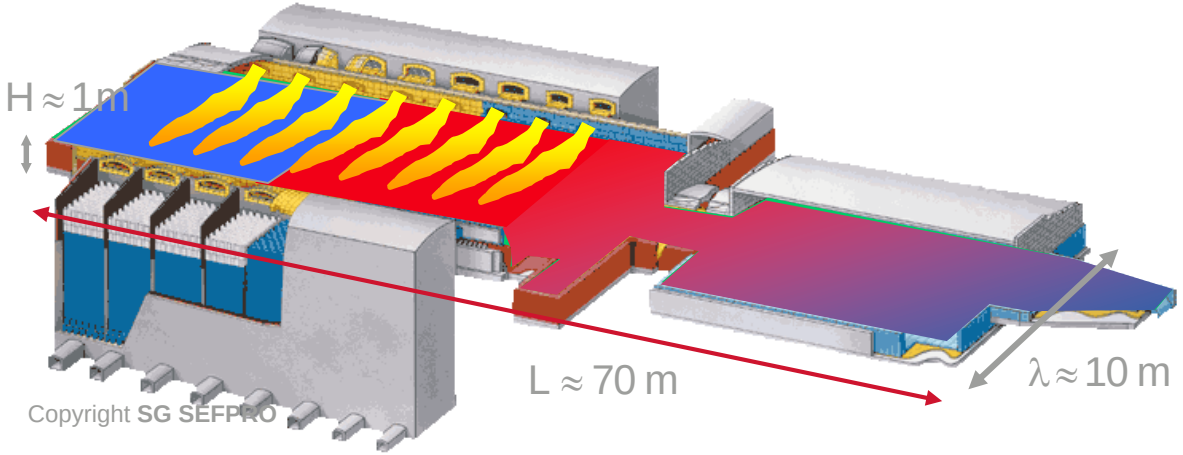
Glass 0.6 kg CO_2 / kg glass (Europe)
Cement 0.9, Steel 1.8
Plastic 1-3


Air
1250-1300°C
Q Loss
Q Fuel
Q Air
Q Exhaust
Fumes
1500°C
Q Glass
Glass Melting Tank
Fume losses
600°C
Air
50 °C

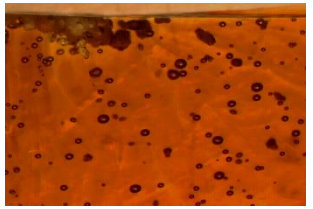
CHANGING THE ENERGY VECTOR

By 内閣

ELECTRIFICATION: HUGE TECHNOLOGICAL CHALLENGES



No bubbles ← Long residence times ← Large volumes



ISOVER RECYCLING

SAINT-GOBAIN GLASS RECYCLING
The complete service for closed-loop recycling
SAINT-GOBAIN

TOWARDS 100% RECYCLED GLASS

First Zero-Carbon Production of Flat Glass

ANICHE PLANT (North of France)

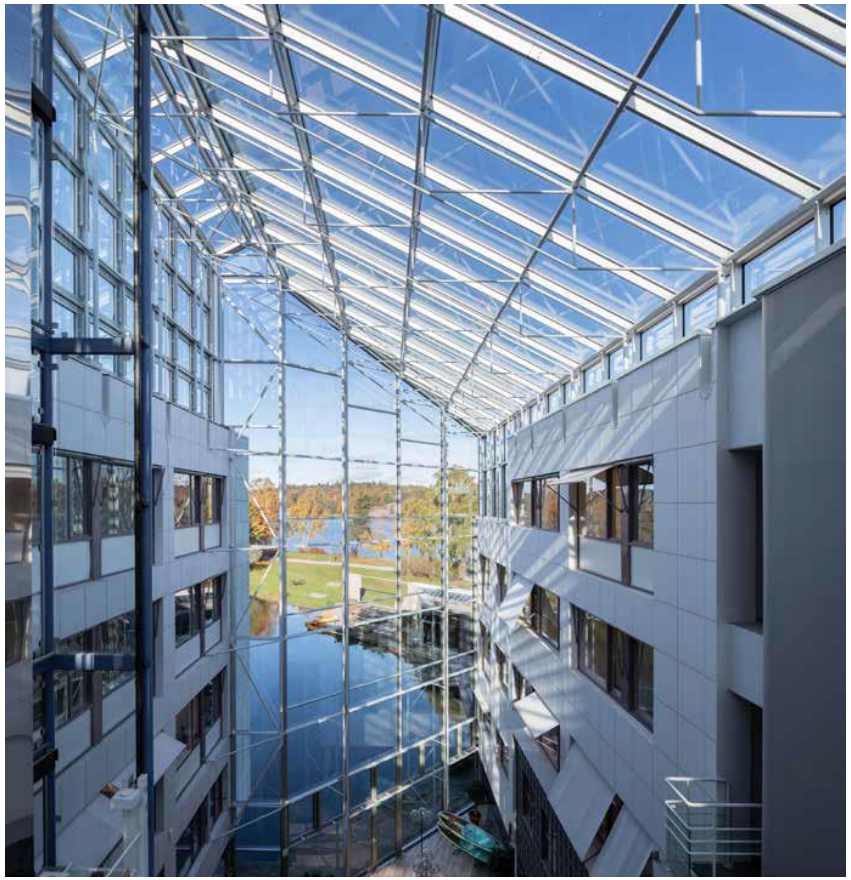
100 % Recycled Glass

- from production offcuts
- from end-of-life glass (renovation or demolition sites)

100 % Green Energy

- from biogas
- Decarbonized Electricity

May 2022



EXTERNAL GLASS WOOL SCRAPS IN GLASS MELTING

EXTERNAL SCRAPS IN GLASS MELTING

Process design sheet

Reception from collectors

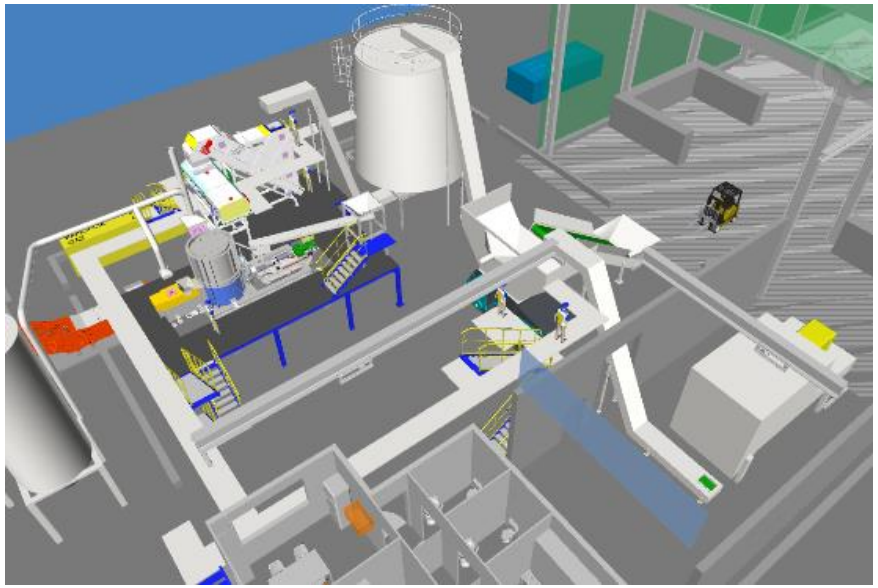
Depollution and crushing

Remelting

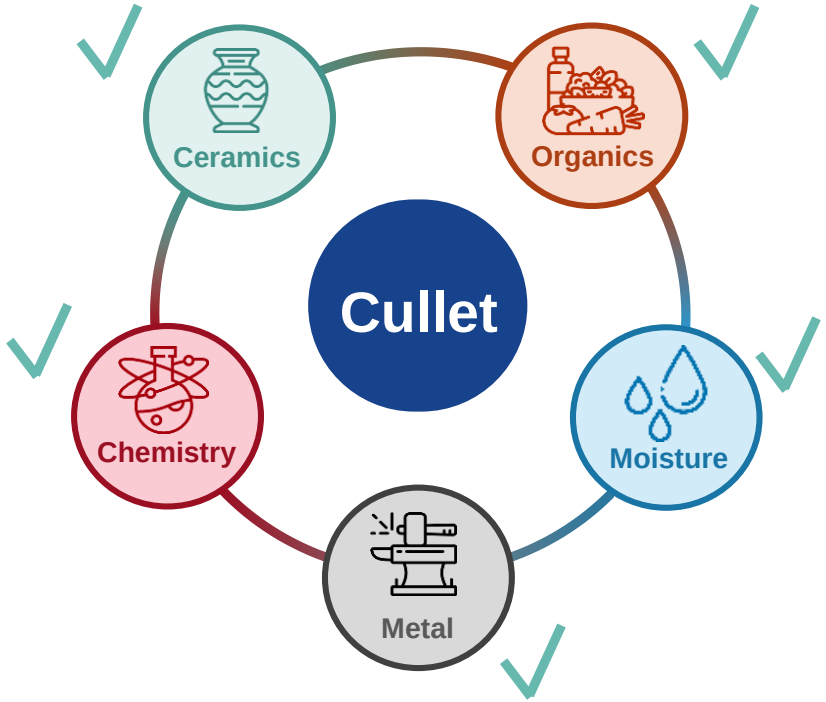
Melting in electrical furnace

Fiberizing

Chemillé



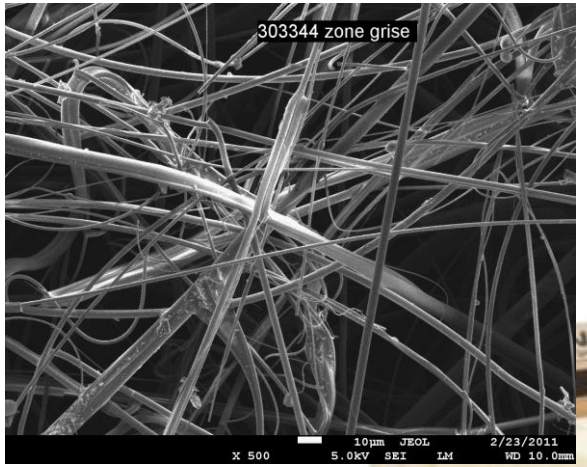
Plant prototype (Q2-2023)




ISOVER

HOW TO DESIGN AN INSULATING MATERIAL?

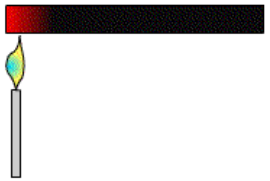
…WITH COMMON MATERIALS



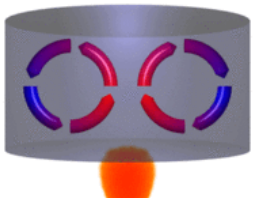
HOW TO DESIGN AN INSULATING MATERIAL?

BASICS OF HEAT TRANSFER

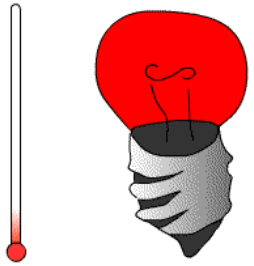
Conduction

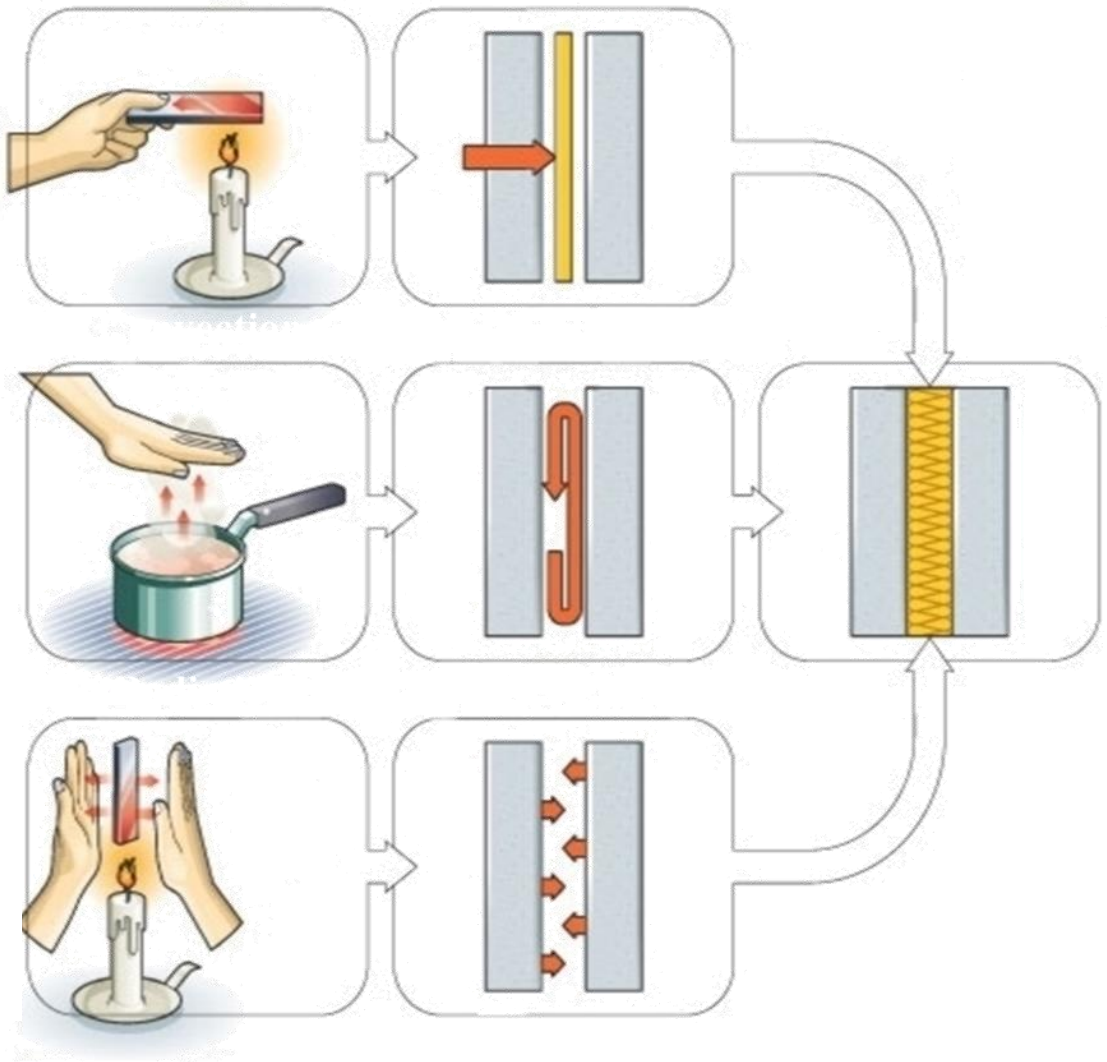


Convection

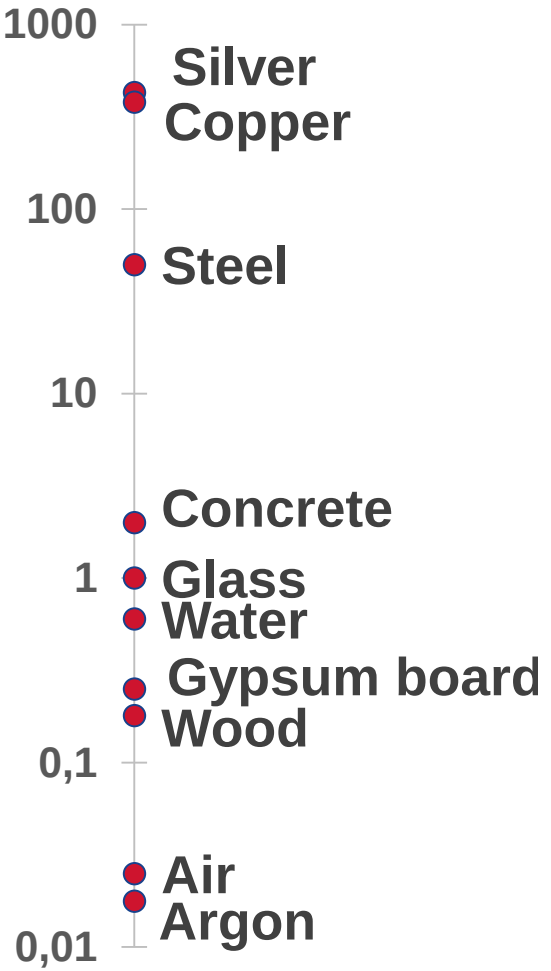


Radiation

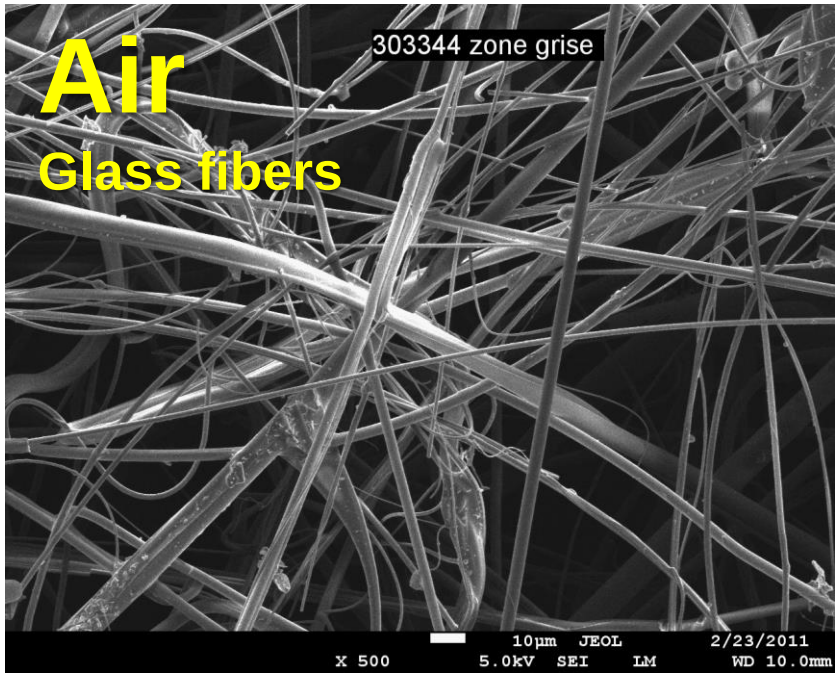


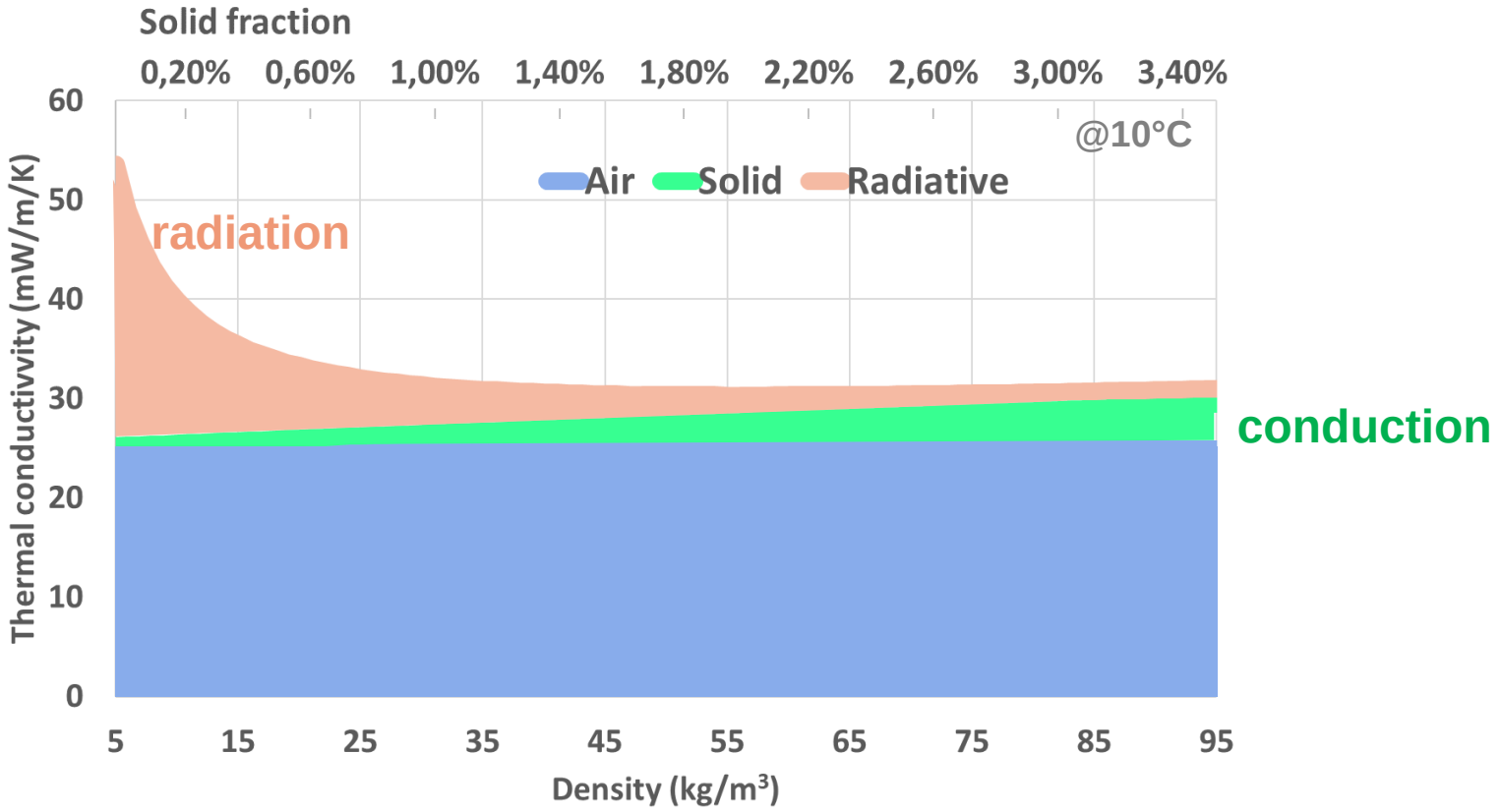


λ [W.m^{-1}.K^{-1}] at 10°C



PHYSICS OF INSULATING MATERIALS

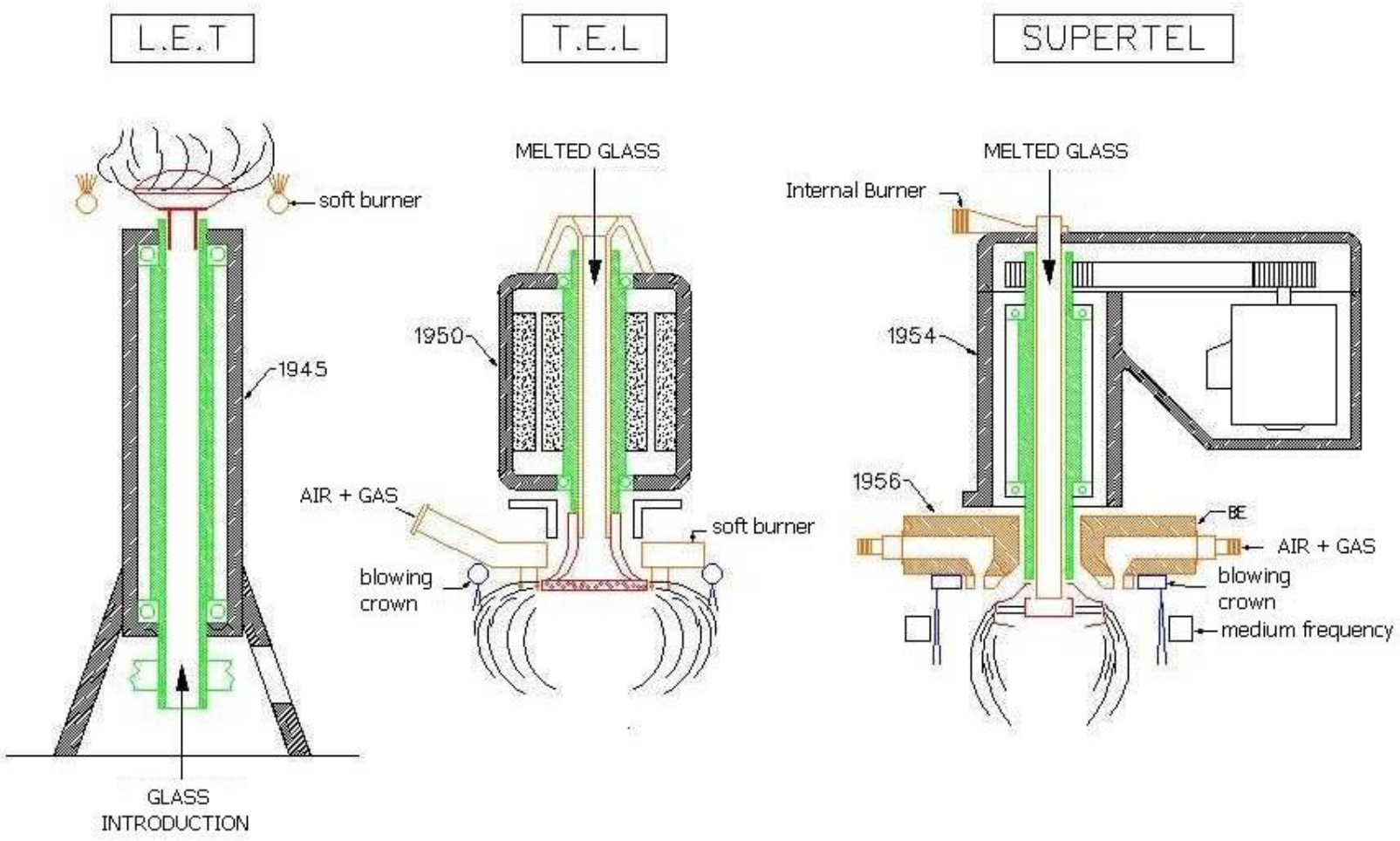




Thinner fibers are better (more « pockets » for a given amount of conduction)

Cotton candy at 1000°C, 2000 rpm,
30 tons/day!

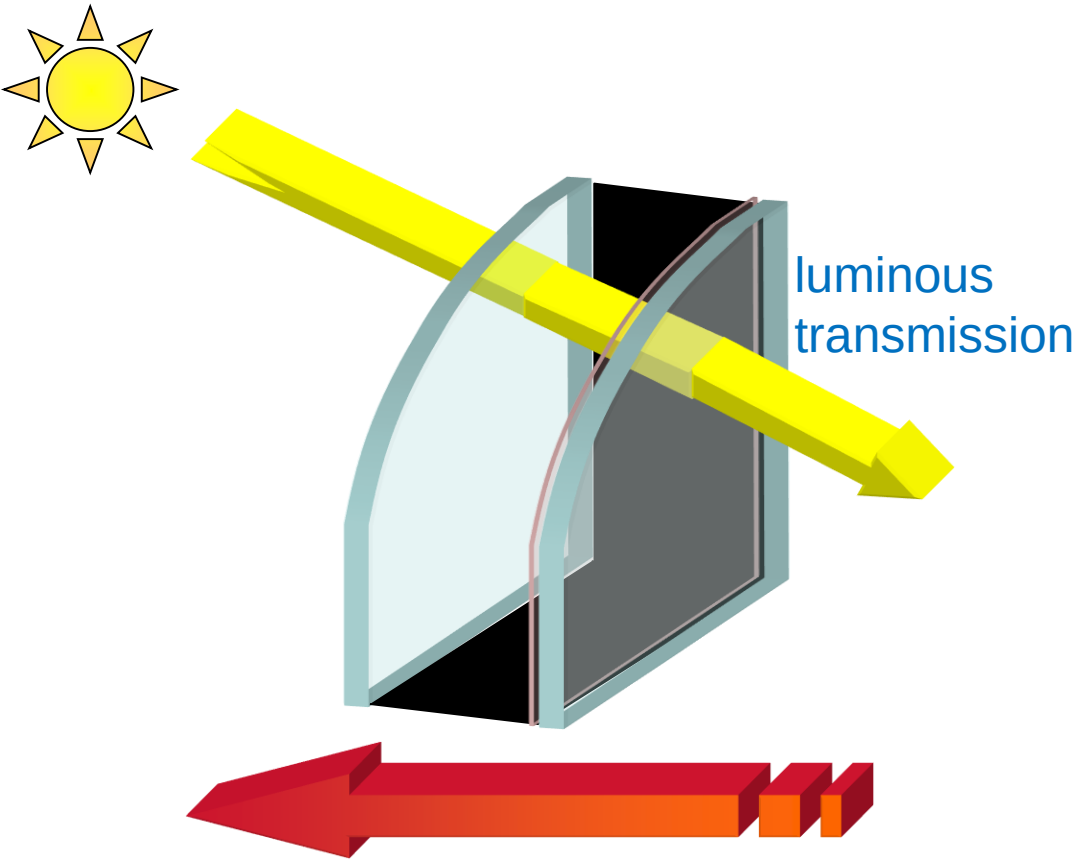
EVOLUTION OF THE TEL PROCESS: TOWARDS FINER FIBERS



L.E.T. : Thermal Testing Laboratory
(Laboratoire d'Essais Thermiques)

THERMAL INSULATION AND SOLAR CONTROL

GLAZING PERFORMANCE

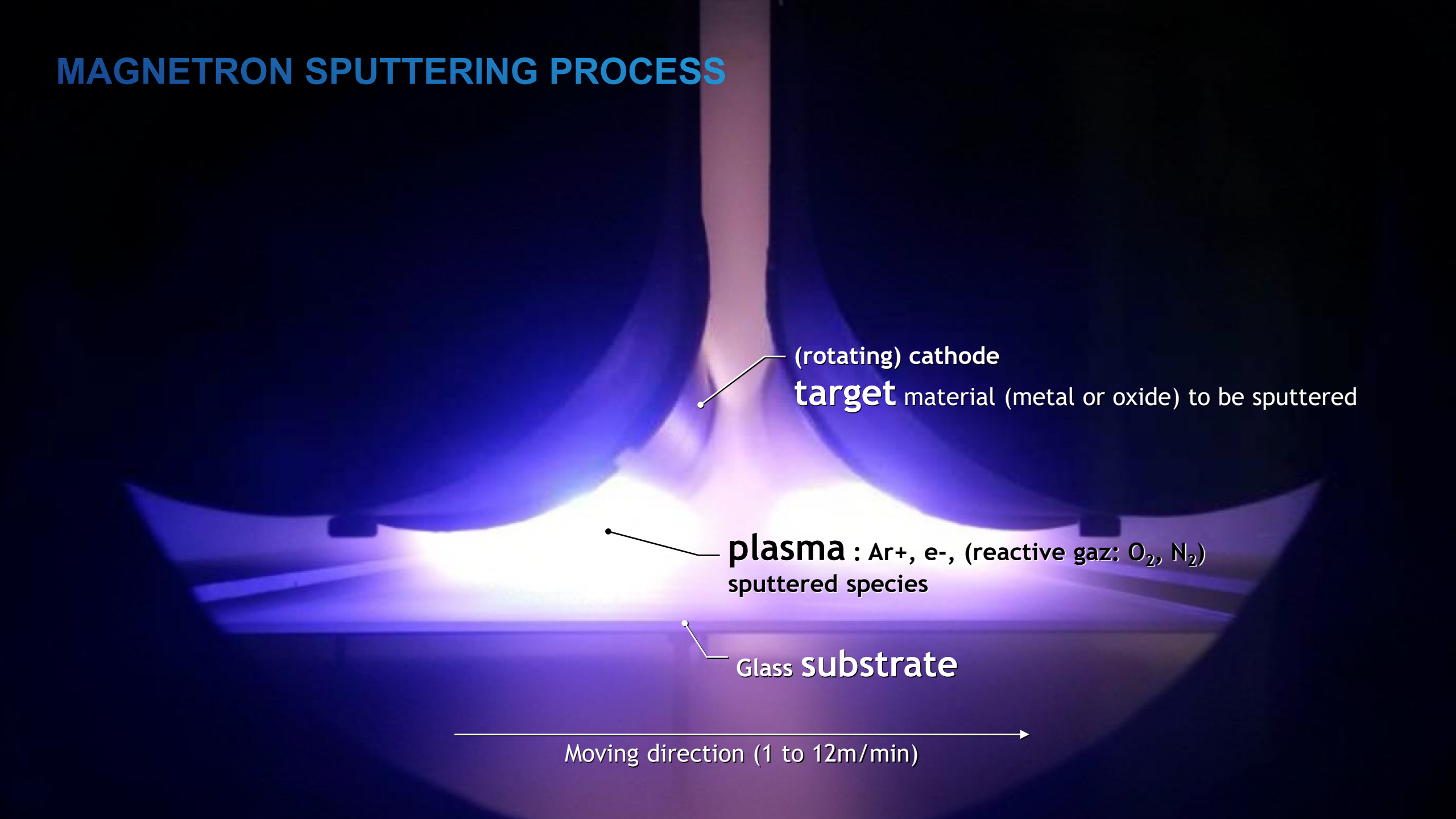


U-value = Insulation properties

Insulation: U-value (W/m².K)

- Not insulated wall: ~2
- Well insulated wall: ~0,4
- Simple glazing: ~5,5
- Double glazing with no coating: ~2,5
- Best double glazing with Low-e coating: ~1
- Best triple glazing with two low-e coatings: ~0,6

MAGNETRON SPUTTERING PROCESS

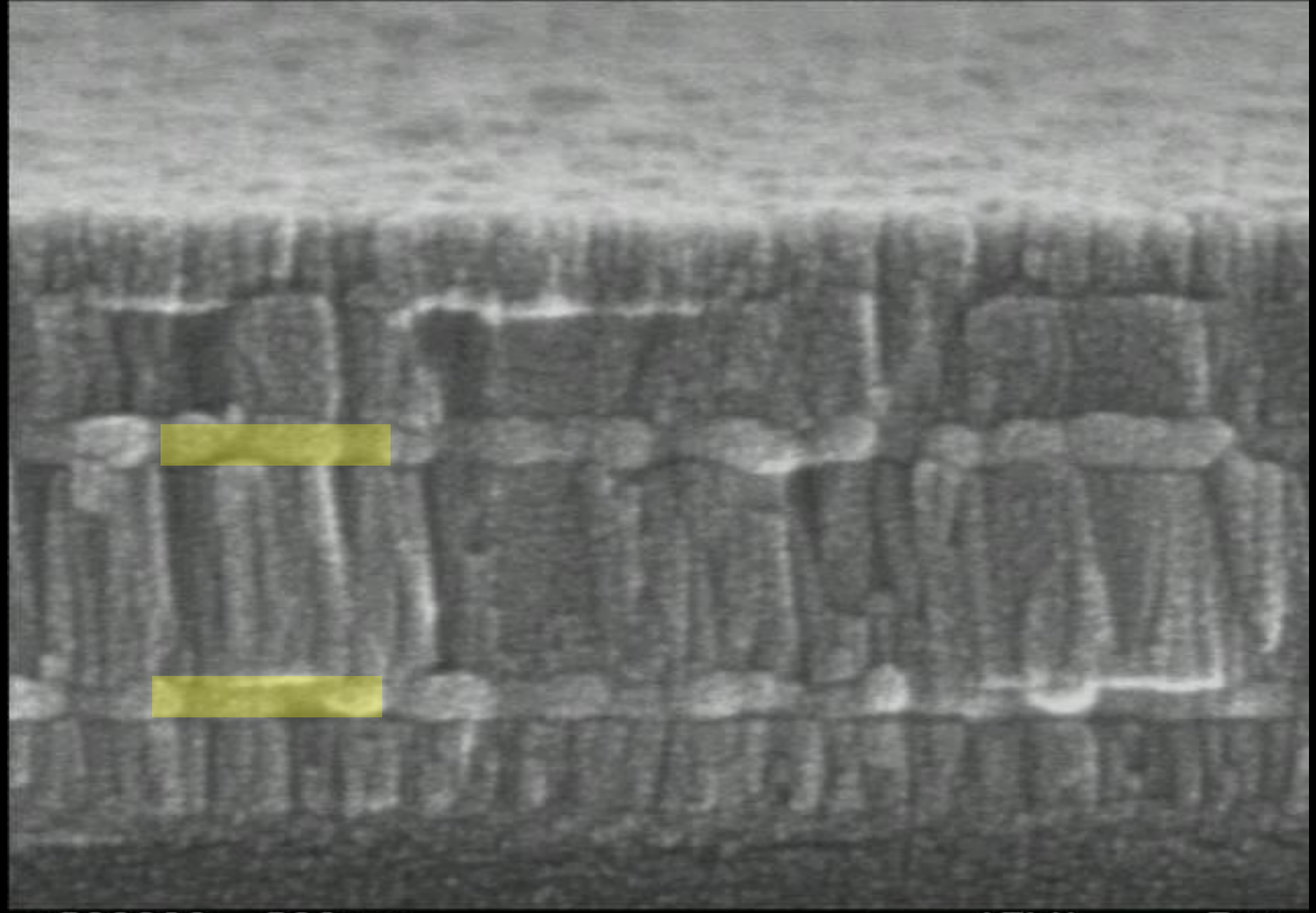


MAGNETRON SPUTTERING PROCESS

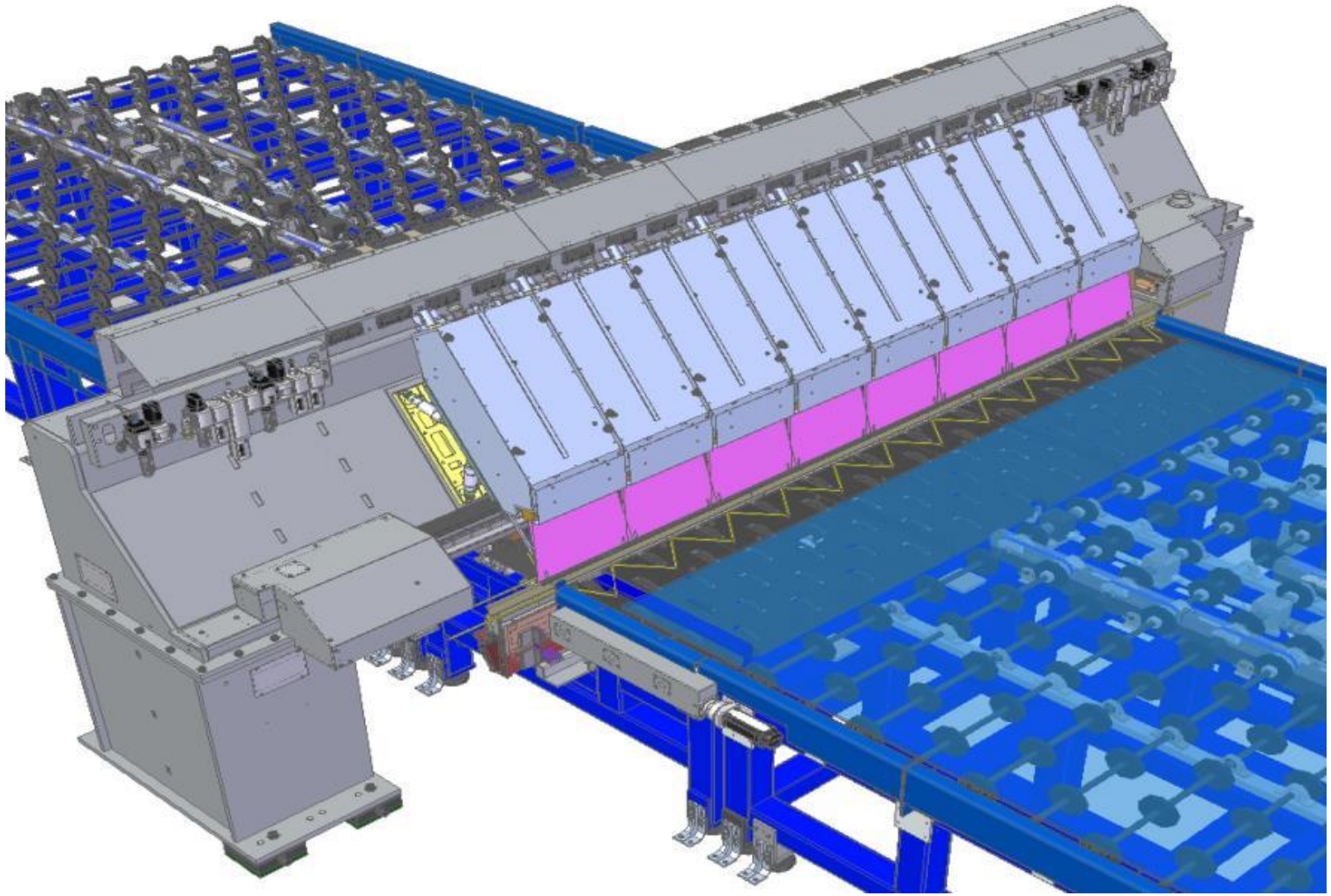
More than 20 materials to deposit sequentially

Challenges:

- ✓ Homogeneity
- ✓ Deposition rate
- ✓ Yield
- ✓ Stability

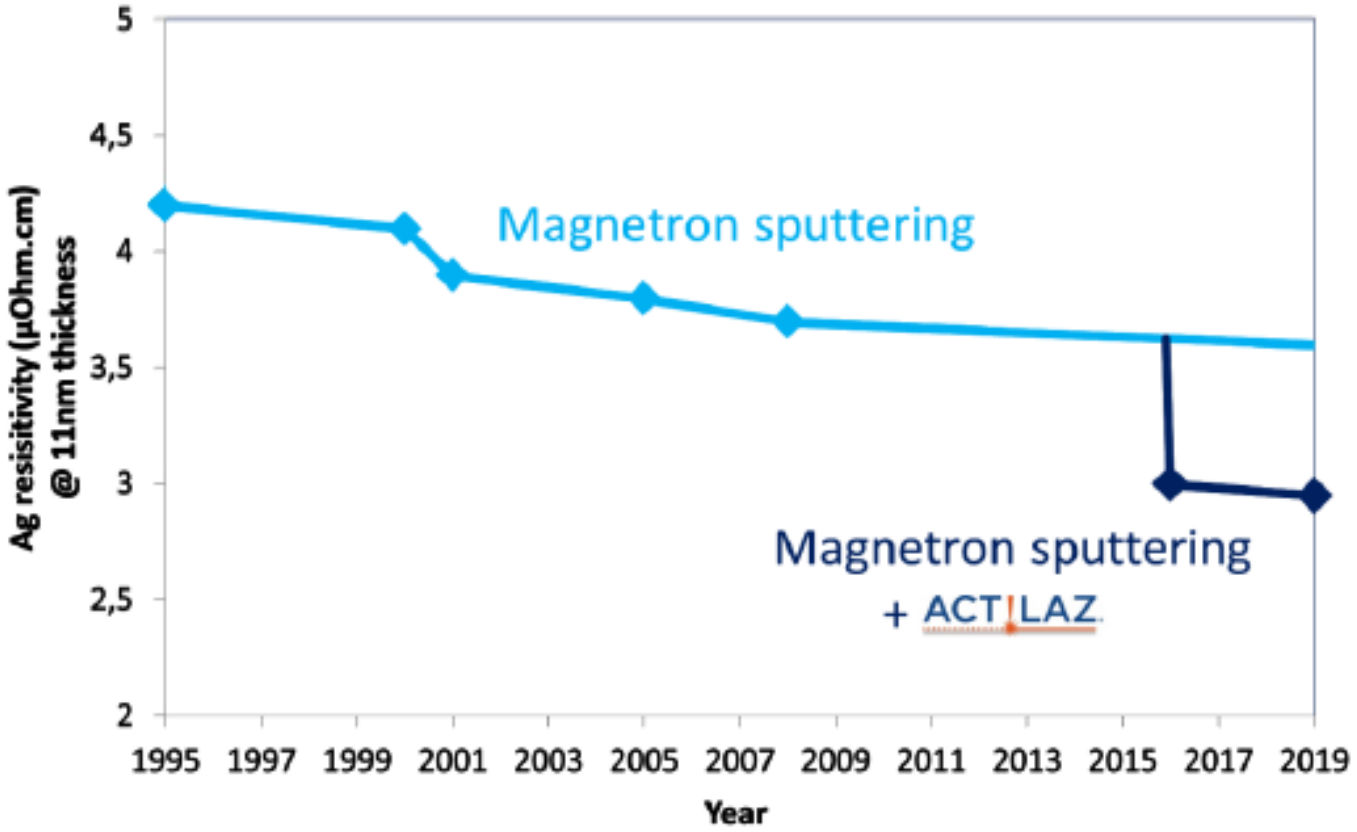

x200000 200nm 15kV 5mm
#0 ECH. NON BOMBE *SGR* M421
512 x 512 1-6.TIF

LASER ANNEALING OF THIN FILM COATINGS ON LARGE AREA GLASS SUBSTRATES



Developed in collaboration with Trumpf and Manz

LASER ANNEALING OF THIN FILM COATINGS ON LARGE AREA GLASS SUBSTRATES




SageGlass®

GLAZING & GLASS WOOL

The CO_2 emitted to produce an energy efficient doule glazing is offset within 6 to 20 months by its energy savings

After just 3 months, the emission savings of a building insulated with mineral wool outweight the emissions generated during the production of mineral wool.

THANK YOU !

Acknowledgements:
H. Arribart
J.-M. Flesselles
R. Jribi
F. Lerbet
C. Ozanam
C. Jousseaume


TRANSVERSAL
R&D CENTERS
BY SAINT-GOBAIN
THANK YOU!
Acknowledgements:
H. Arribart
J.-M. Flesselles
R. Jribi
F. Lerbet
C. Ozanam
C. Wable
SAINT-GOBAIN