



AGC solar mirror

28th of November 2019, Düsseldorf
Presenter: Anne Attout



AGC: a glass manufacturer...

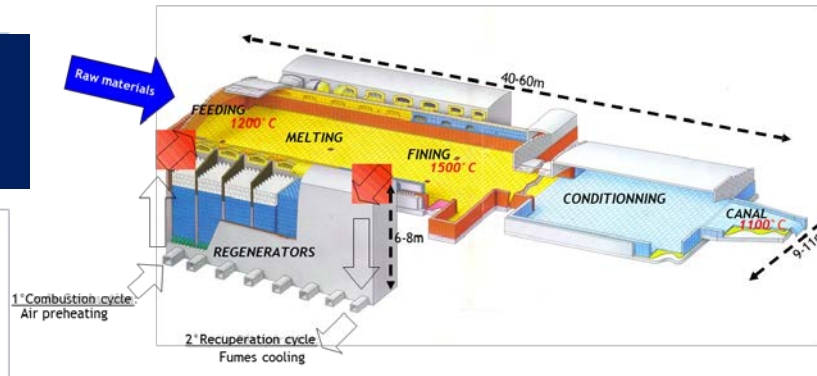
Building & Industrial Glass & Automotive Glass

- External glass
- Decorative glass
- Glass for high tech applications

- Original Equipment Manufacturer (OEM)
- Automotive Replacement Glass (ARG)



N°1 glass producer



16 floats in EU turning sand into flat glass

AGC: a mirror manufacturer...

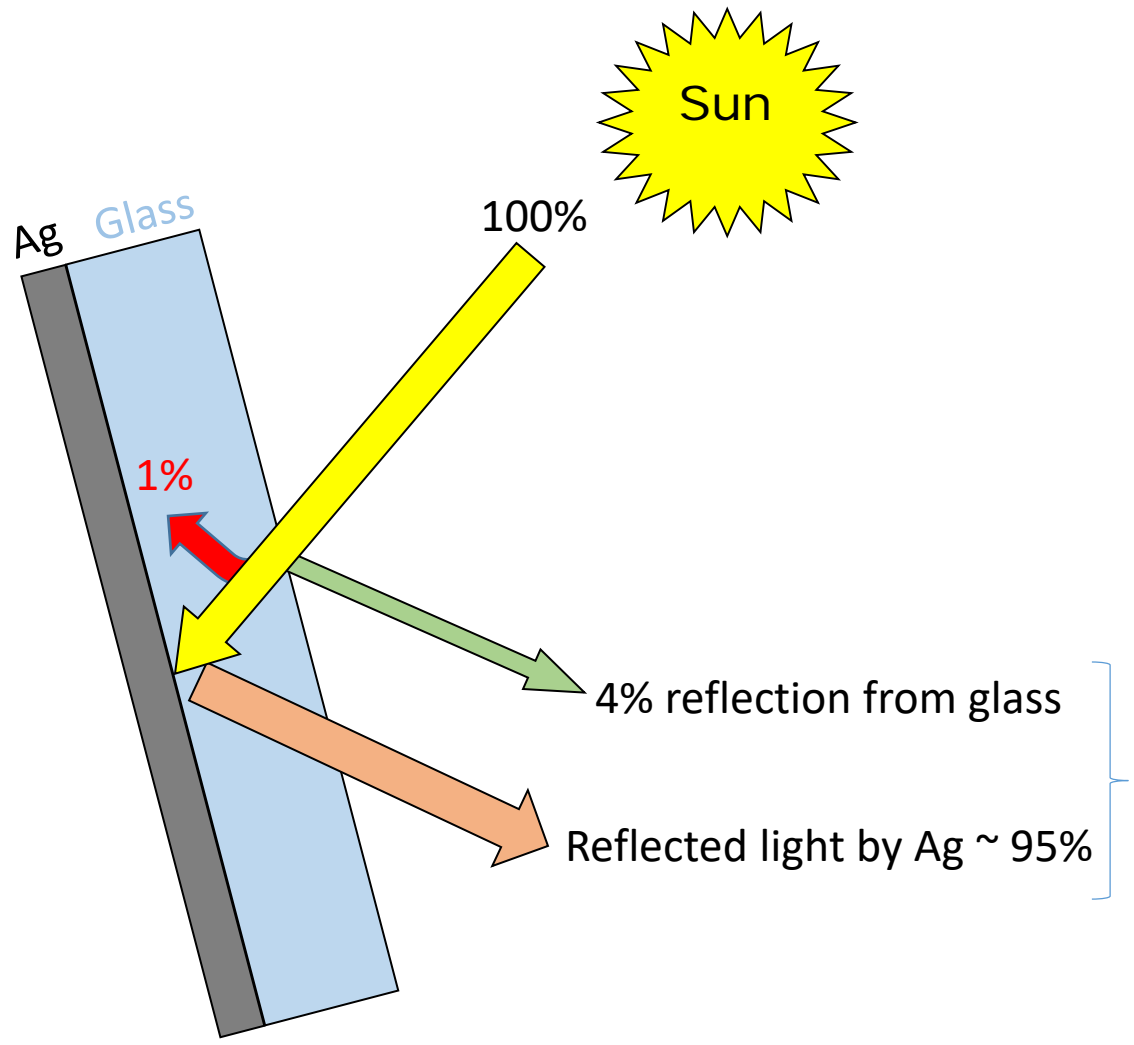


5 mirror lines in EU
producing
18 000 km²/year

Offer a complete solution for the primary reflector!

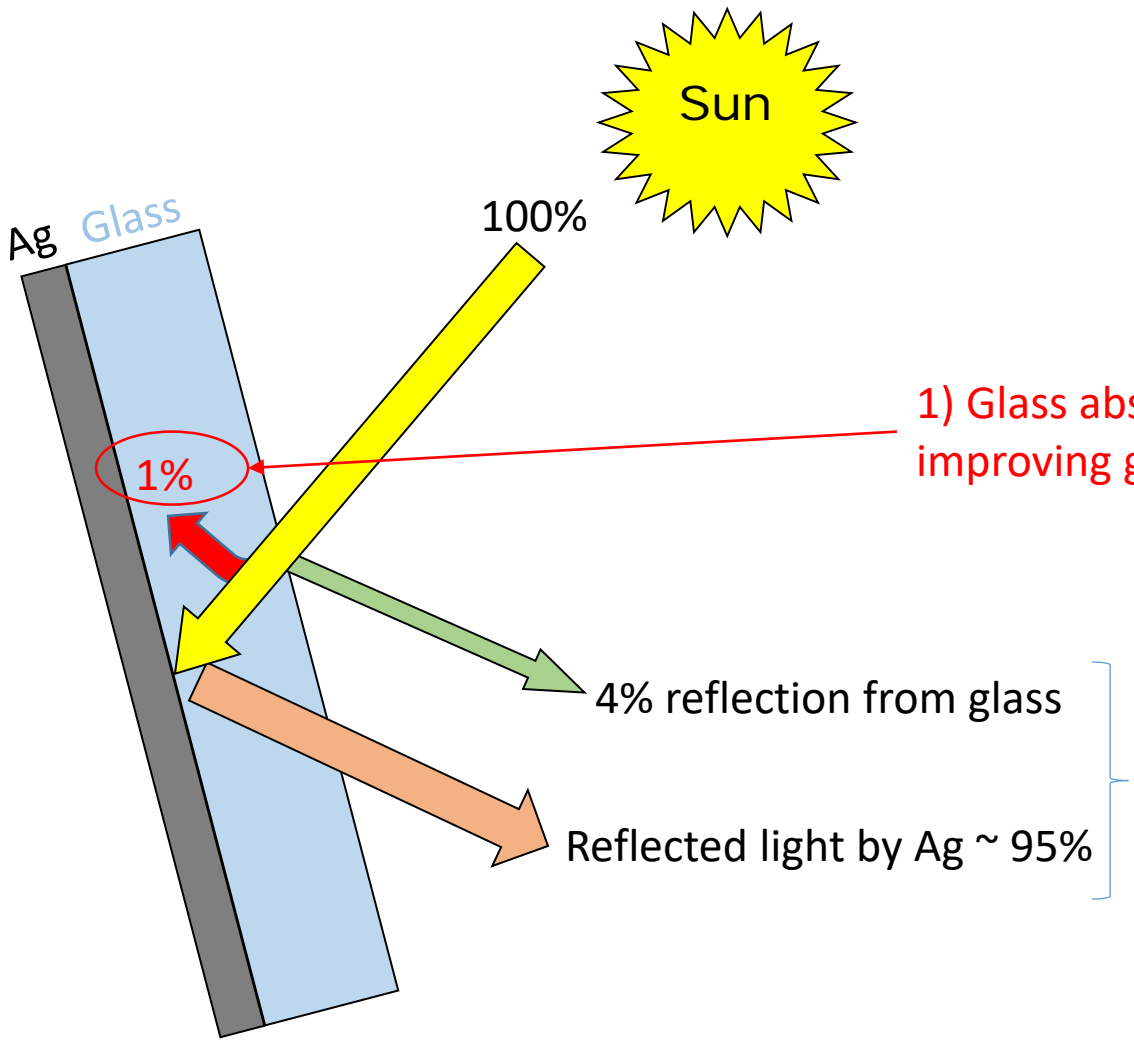


Mirror optical properties



Total reflection:
 $(100-4) \times 0,99^2 \times 0,95 + 4 = 94 \%$

Mirror optical properties



1) Glass absorption can be limited by improving glass composition

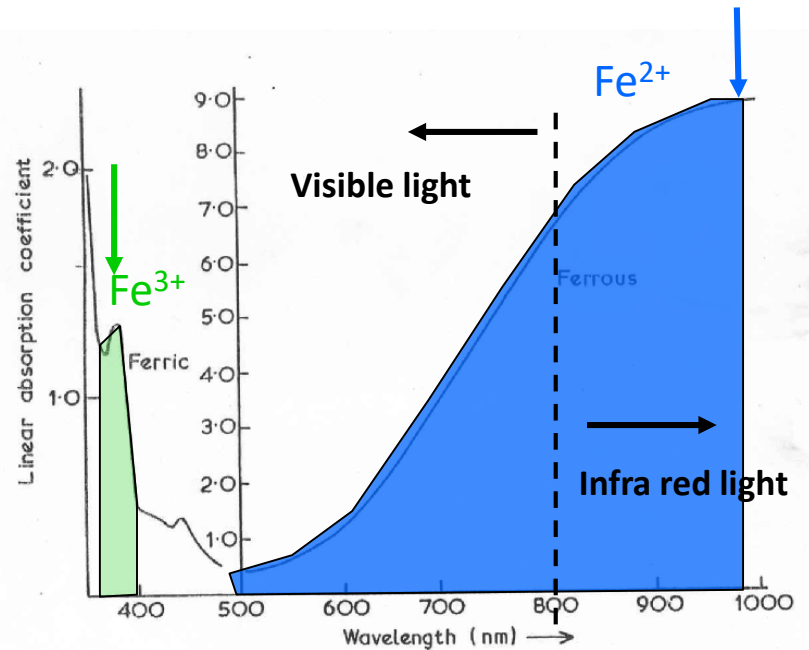
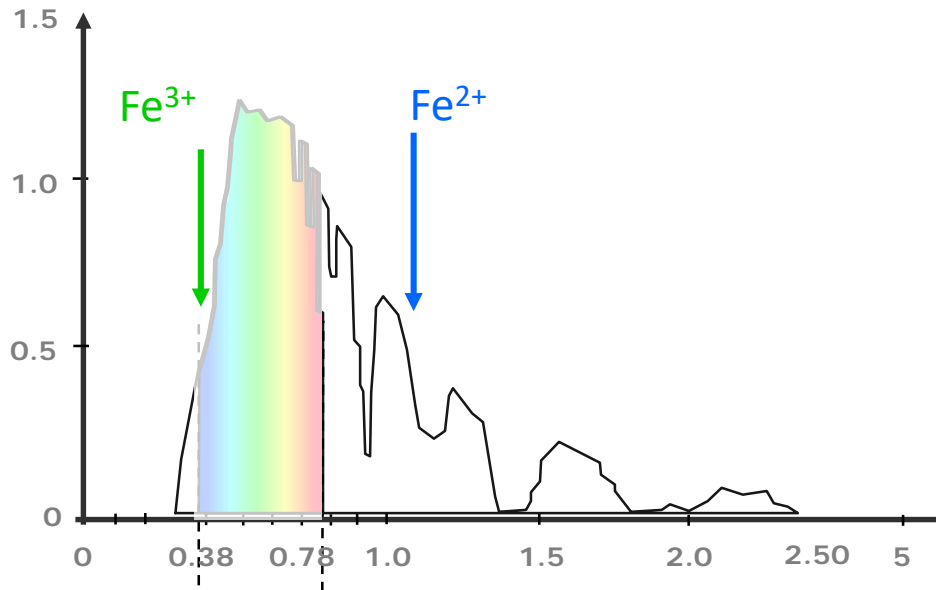
Total reflection:
 $(100-4) \times 0,99^2 \times 0,95 + 4 \sim 94 \%$

Mirror optical properties

- The major coloring principle of glass turns on the presence of **iron** into the glass
- The iron can be present in two oxydized forms

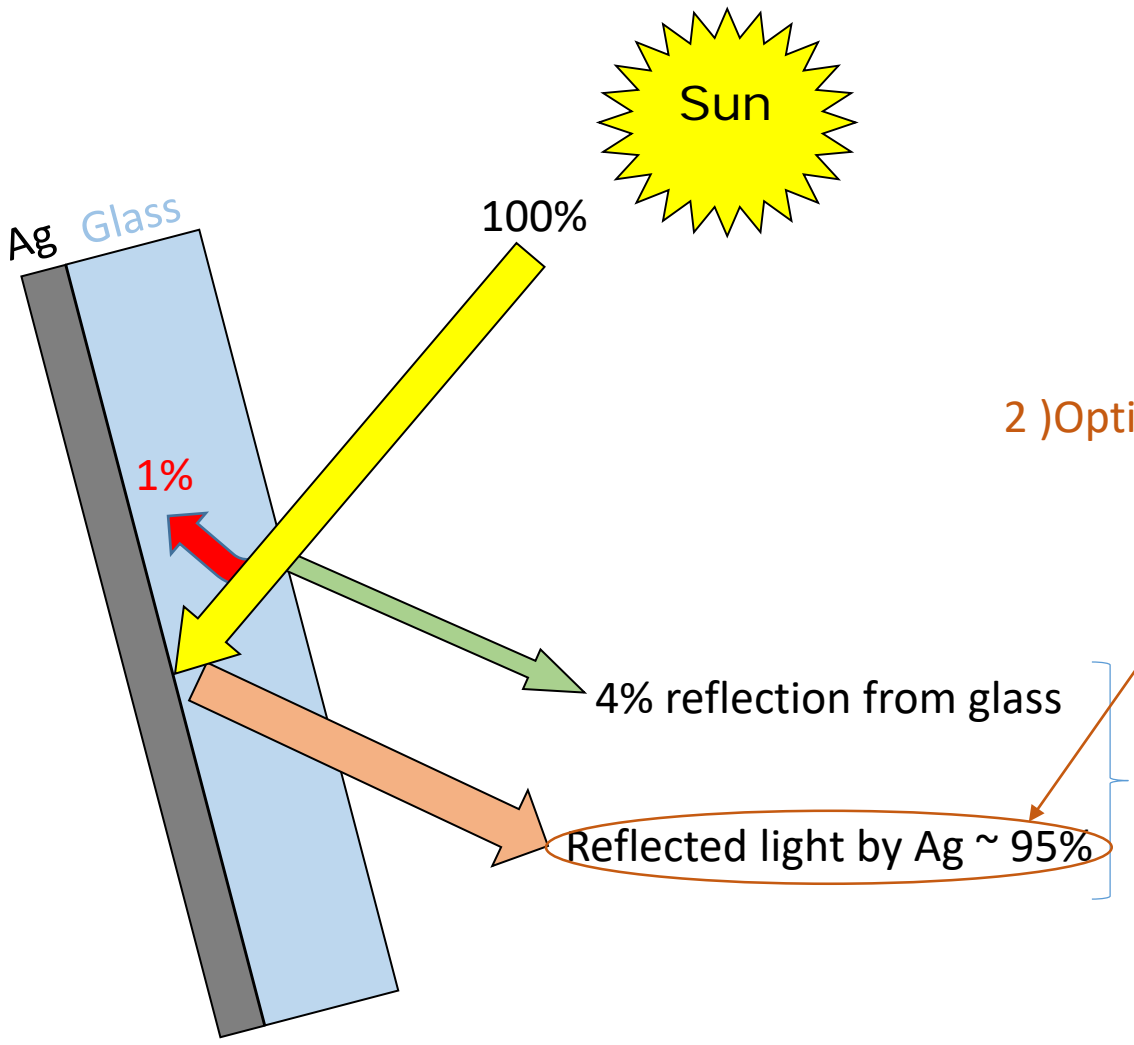
Fe^{2+} (colors the glass BLUE) + **ABSORBS ENERGY !!**

Fe^{3+} (colors the glass GREEN)



Glass for solar mirror : redox control & $Fe_2O_3 < 250\mu m$

Mirror optical properties

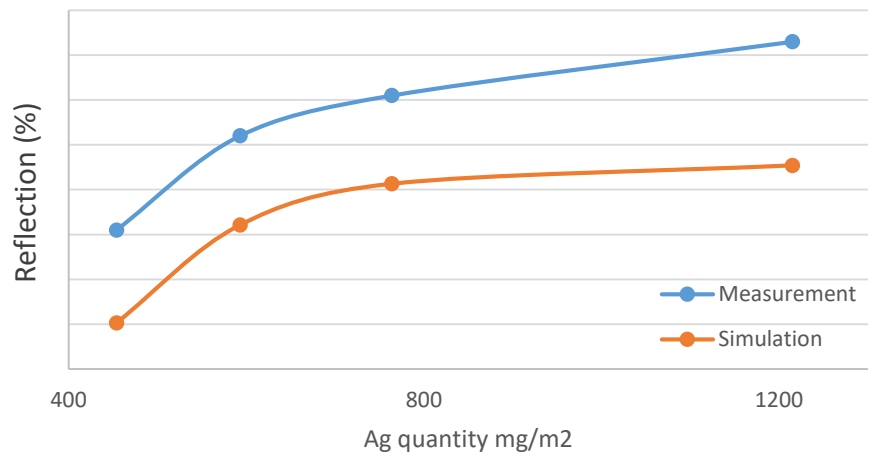


2) Optimize the Ag reflection

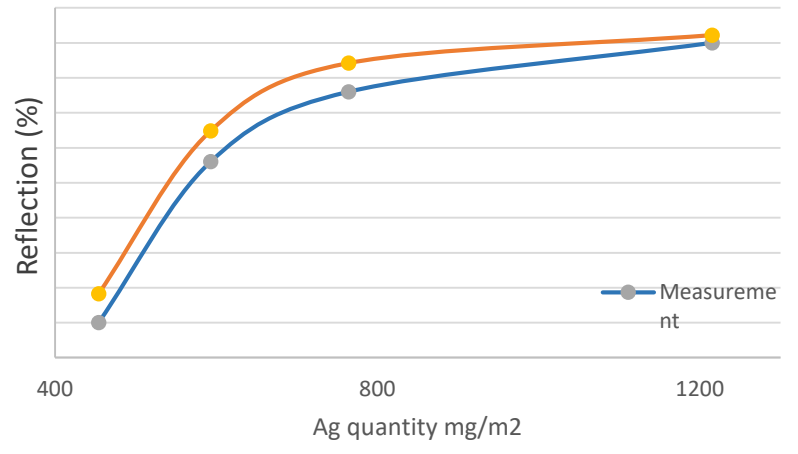
Total reflection:
 $(100-4) \times 0,99^2 \times 0,95 + 4 = 94 \%$

Mirror optical properties

Reflection glass side



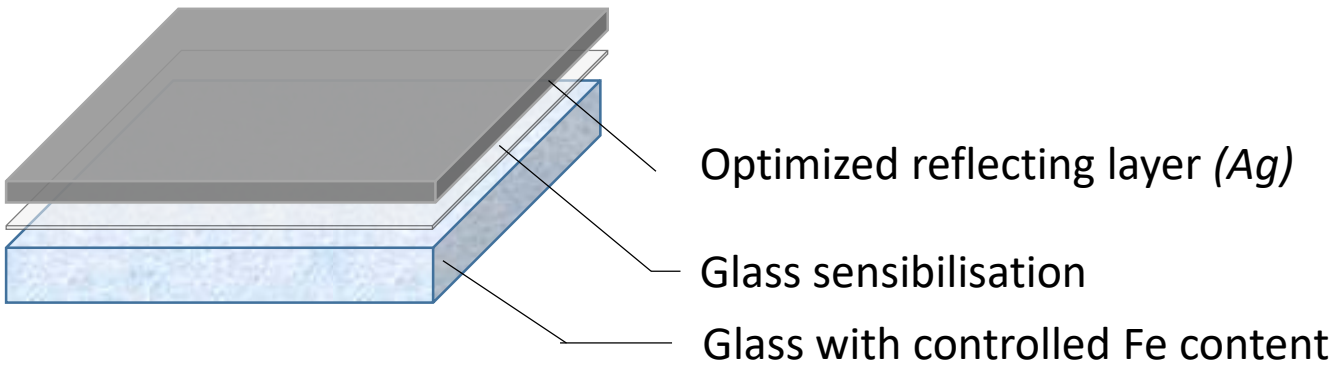
Reflection on coating side (no paint)



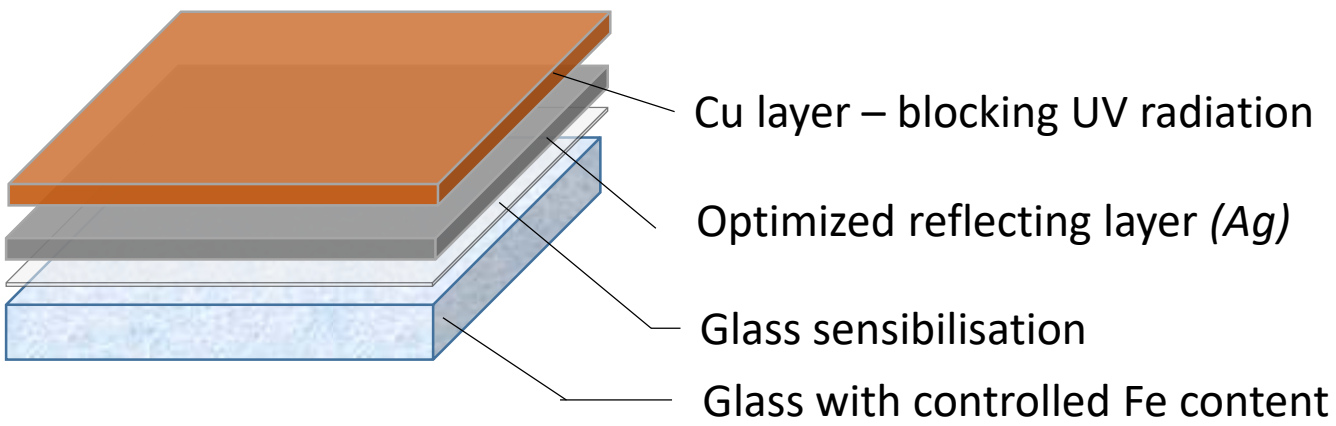
Ag quantity has been optimized to reach higher reflection

Importance of glass preparation before Ag application

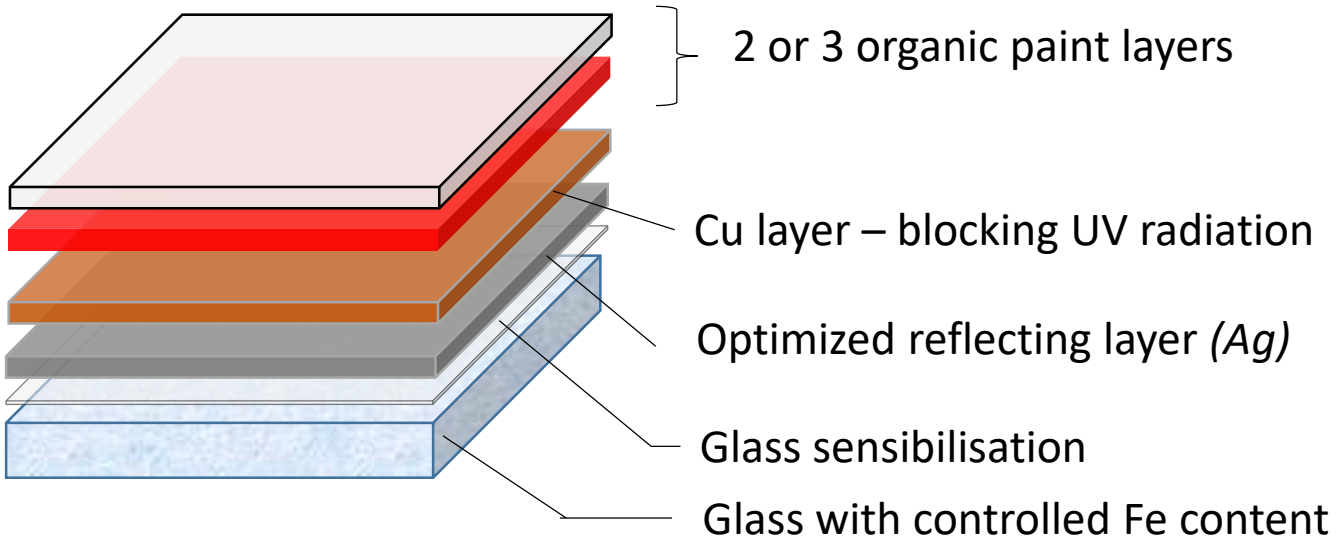
Mirror durability



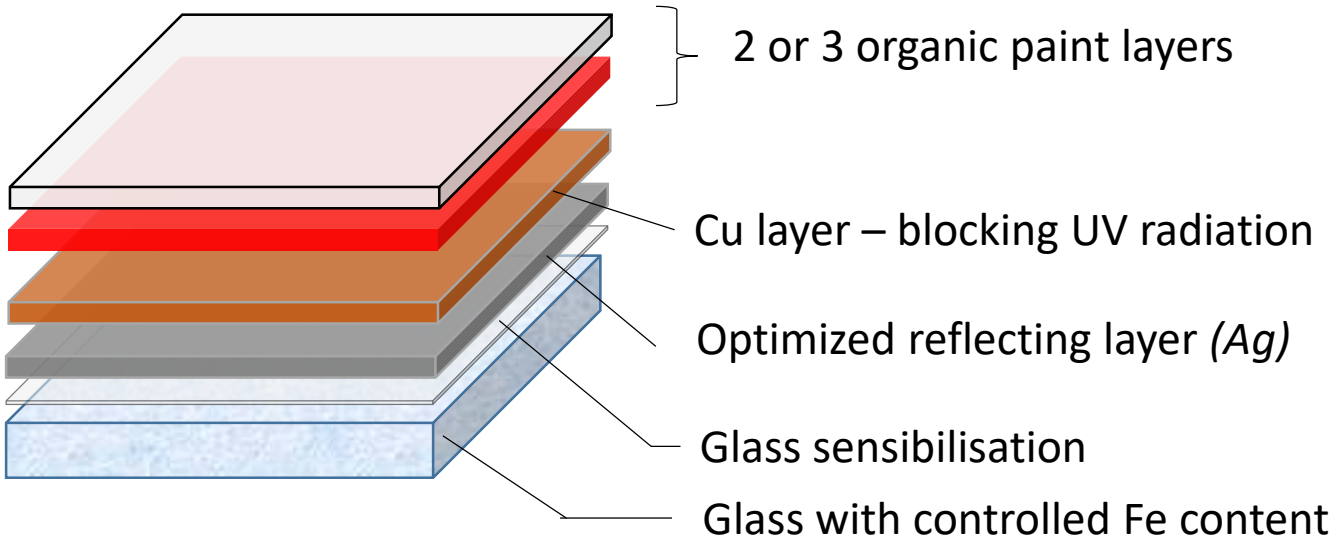
Mirror durability



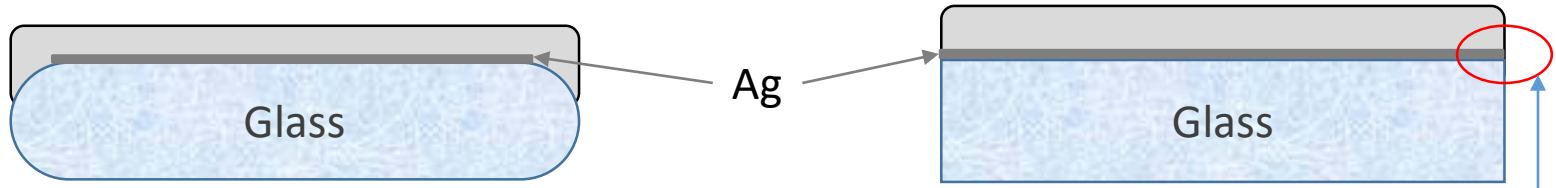
Mirror durability



Mirror durability

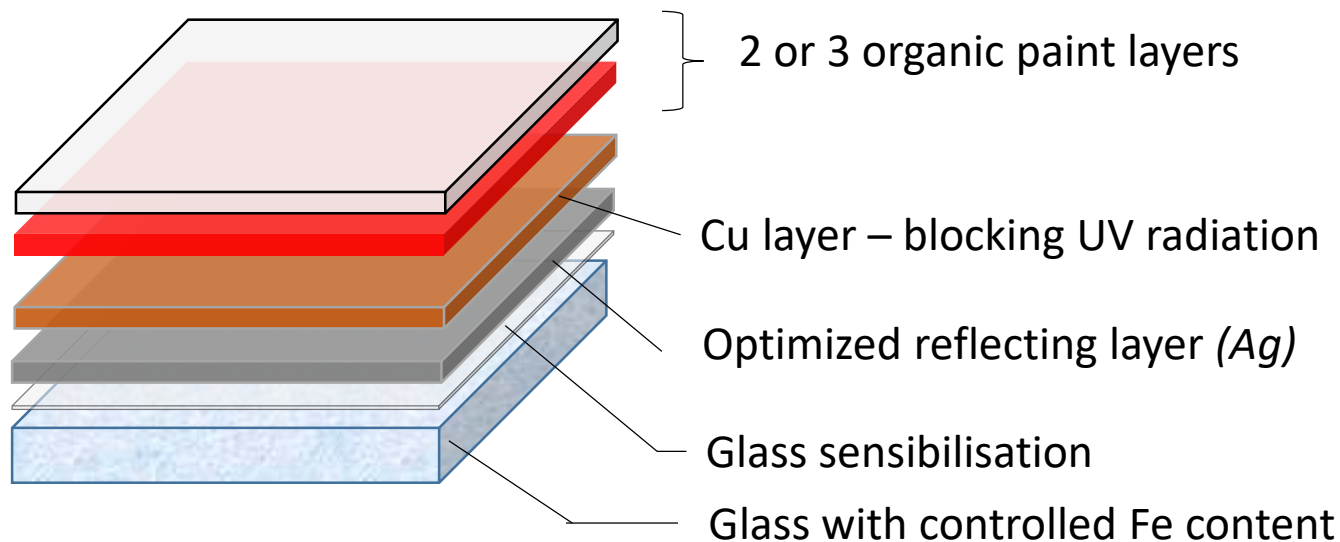


→ Attention point for mirror durability: edge protection



Mirror has to be produced on grinded mirror to avoid « naked silver »

Mirror durability



→ AGC mirror = 2 organic paint layers

Same durability as 3 paint layers:

- Same UV resistance;
- Same edge corrosion after ageing tests;
- Same scratch resistance;
- Same external exposure performance (EMMAQUA tests,...);
- Same resistance to humidity and cycling tests;
- ...

Conclusions

Solar mirror:

Optical properties and durability are optimized in comparison with indoor mirror

- Best optical glass properties
- More Ag
- Better paint durability



Developments:

- Glass optical properties is a permanent R&D project
- Pb removal in the organic paint
- Cost optimization
- Glass protection with anti-soiling / hard coating without affecting optical properties
- ...