



Protec

SURFACE TECHNOLOGIES

The Perfect Combination For High Durability Eye Frames: Base Material Combined With Deformation Technology And Vacuum Coatings

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WHO WE ARE?



Protec Surface Technologies S.r.l.

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- **An Italian leading company in PVD-PECVD Equipment market for the last 20 years**
- **Providing innovative and customized solutions**
- **Strongly believing in young people, green technologies, R&D and continuous improvement**

WHAT WE DO?

Vacuum coating machines

P
F
1
1
0
0
C
R



N
F
4
0
0

**Hybrid
PVD-
PECVD**

P
F
1
5
0
0
C
R



D
C
1
1
0
0



PVD

INTRODUCTION

● PVD – PECVD Coatings

● Magnetron Sputtering (MS)

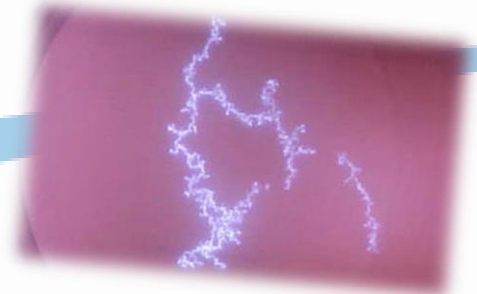
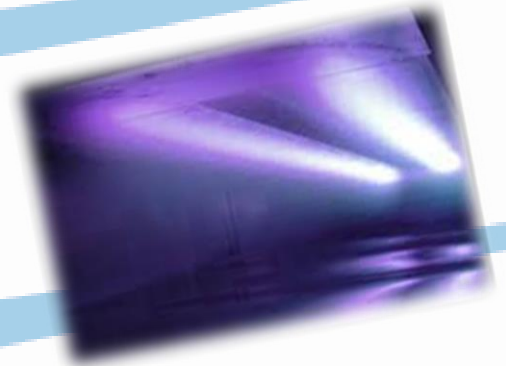
● Balanced, Unbalanced, Dual, Dual Pulsed, HiPIMS

● Cathodic Arc Evaporation (CAE)

● LDE, Circular and Rectangular target

● Plasma Enhanced Chemical Deposition (PECVD)

● PBS



INTRODUCTION

● Decorative PVD Coatings



Plastics

Metals



MATERIALS AND TECHNOLOGIES

**Metals and metal alloys can acquire interesting properties if worked with two innovative technologies:
MIM (Metal Injection Molding) and Liquidmetal**

MIM

 Stainless Steel

 Titanium

 German Silver (Alpacca)

 Monel

LIQUIDMETAL

 Zirconium based alloys

TECHNOLOGIES

● Metal Injection Molding (MIM)

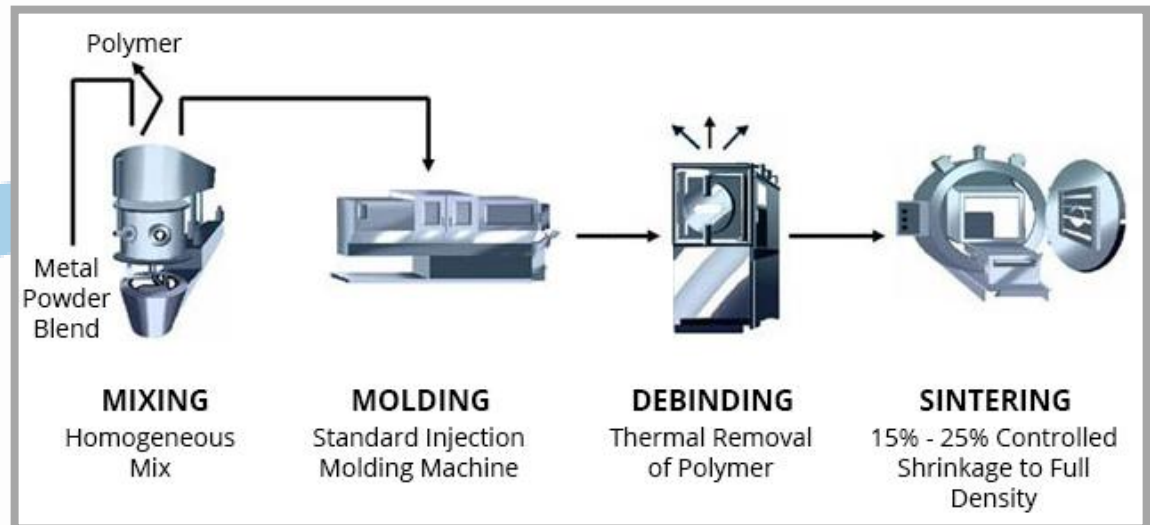
● Finely-powdered **metal** + binder material



shaped and solidified by **injection molding**

● Debinding

● Sintering



TECHNOLOGIES



● MIM: Advantages

● Small-complex parts large quantities

● No additional processing

● Minimizing scrap

● Good surface finish

● Environmentally-friendly

● No waste resources (granulates are recycled)

} Cost reduction by
comparison with
CNC Machining

TECHNOLOGIES

● Liquid metals*

● Amorphous metal alloys

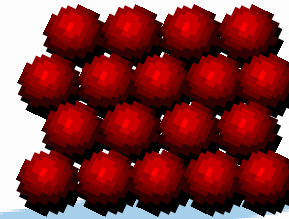
● Process:

● Melting

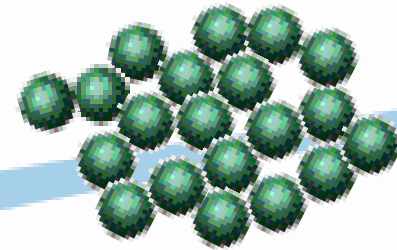
● Fast cooling mold

● Removing

Crystalline



Amorphous



Single molding step

* (Caltech: California Institute of Technology)

TECHNOLOGIES

● Liquidmetals*: Advantages

● Superior properties than conventional metals

- High corrosion and wear resistance

- High elasticity

- Low specific weight

- Good surface finish

- Environmentally-friendly

- No waste resources (sprue is recycled)

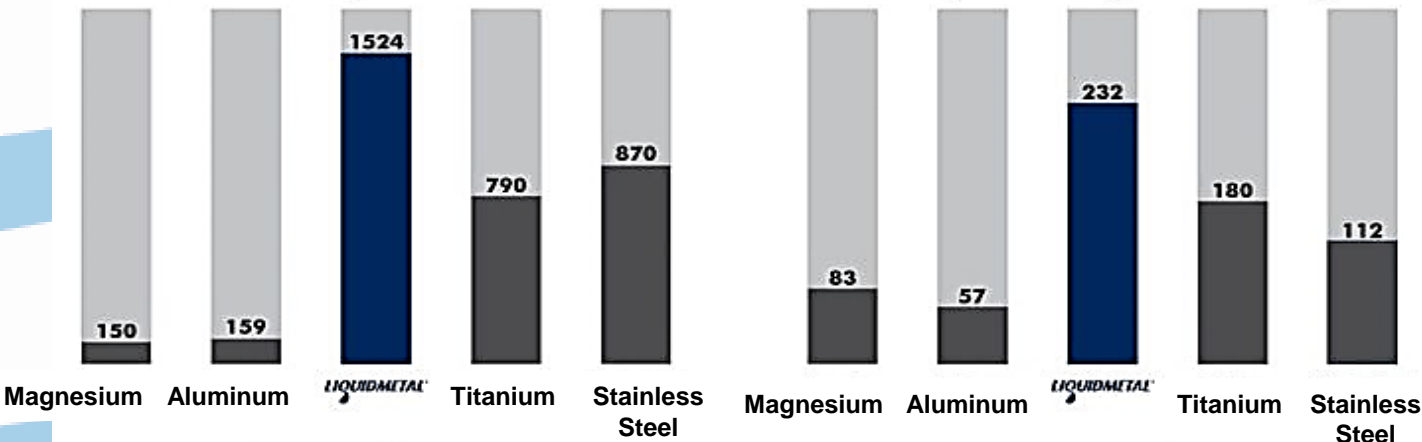


* (Caltech: California Institute of Technology)

TECHNOLOGIES

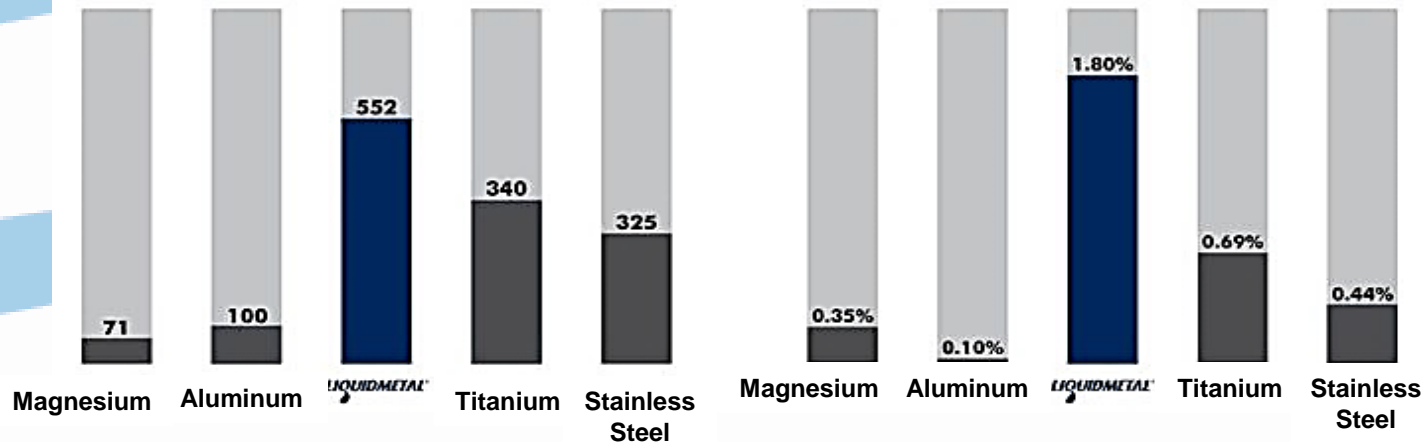
Strength (MPa)

Strength-to-Weight (MPa.cm³/g)



Hardness (Vickers)

Elasticity (% of Original Shape)



Liquidmetal[®]
compared
with other
metals

*results published by Liquidmetal[®] Technologies

APPLICATIONS

● MIM and LIQUIDMETAL

● Medical and dental branch

● Automotive field

● Watchmaking

● Sporting goods

● Eyewear



APPLICATION IN EYEWEAR?

● Advantages:

● Metals with high elasticity

● Net shape forming

● Low specific weight

● ENVIRONMENTALLY FRIENDLY

● GOOD SURFACE FINISH

INNOVATION

● Environmentally friendly:

- Avoid galvanic processes

- Avoid use of plastic

- Avoid use of paints

● Good surface finish

- Net shape forming

- High quality final product



INNOVATION

- Combination with PVD technologies
- Completely ***environmentally-friendly*** process
- No use of toxic substances
- Realize high quality parts
- Surface finish
- Corrosion, abrasion and scratch resistance

FINISHING

- PVD coatings on standard, MIM and Liquidmetal substrates

- Pure Gold

- “Deep Black”

- ABACO®



GOLD FINISHING

PVD Pure Gold coating

Commercial name	Colour	Technology	L, a, b parameters
Gold 3	Gold	MS	L = 82,8 a = 7,9 b = 33,7
Gold 1	Pale Gold	MS	L = 83,1 a = 3,1 b = 20,7
Rose gold	Rose gold	MS	L = 85 a = 11 b = 24

“DEEP” BLACK FINISHING

PVD Black coating

Commercial name	Colour	Technology	L, a, b parameters
Black 4	Black	CAE	L = 33 a = 0,6 b = 0,7
Black 8	Deep Black	MS	L = 26 a = 1,2 b = 2,8

ABACO® FINISHING

● ANTIBACTERIAL and ANTIMICROBIAL COATING

● Validation tests (JIS Z 2801 / A12012)

● University of Navarra (Spain)

● Department of Molecular and Translational Medicine of
the University of Brescia (Italy)

● Effectiveness of the coating

● Escherichia coli and Staphylococcus aureus

CONCLUSIONS

- Combination of different technologies
- Completely ***environmentally-friendly*** process
- Good surface finish
- Corrosion resistance*
- Avoid use of plastic in favour of metals

*Depending on the metal



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THANK YOU!

