UOR 3:
TRIBOLOGY AND SURFACE ENGINEERING

Department of Physics
Laboratory SUP&RMAN
SUPerfici & Ricoprimenti
per la Meccanica Avanzata
e la Nanomeccanica

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UNIVERSITÀ DEGLI STUDI
DI MODENA E REGGIO EMILIA

InterMech Mo.Re.

UOR 3:
TRIBOLOGY AND SURFACE ENGINEERING

Mission

L'UOR 3 si dedica alla realizzazione e allo studio delle proprietà meccaniche e tribologiche
di superfici e rivestimenti alla
nano/micro/macro-scala.

Attività e servizi

• Progettazione, sviluppo ed ingegnerizzazione di trattamenti e rivestimenti superficiali orientati al controllo di attrito ed usura.

• Studio delle proprietà tribologiche, meccaniche, chimiche, strutturali di rivestimenti ternari.

• Realizzazione di ricoprimenti multistrato e loro caratterizzazione tribomeccanica.

• Realizzazione e ottimizzazione di ricoprimenti otticamente selettivi della radiazione elettromagnetica, in particolare nello spettro IR, visibile e UV.

FACILITIES AND SINERGY

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JOINT LABORATORY
FOR *SERVICE-CONSULTING*
AND APPLIED RESEARCH *INITIATIVES*

Laboratory SUP&RMAN
SUPerfici & Ricoprimenti per la Meccanica Avanzata e la Nanomeccanica

- Surface testing: microscopy, structural spectroscopy and chemical micro-analysis (SEM+FIB, TEM, ESCA, XPS, XRD…);
- Comprehension and control of surface tribological and mechanical properties from macro- to nano-scale: modelling, tribometer, indenter, profilometer, AFM;
- Test-bench for optical characterizations;
- Design and development of innovative PVD-MS coatings and “new materials”.

- …TO BE ACQUIRED:
  - New multi-configuration tribometer
  - New HR stylus profilometer

COMMON RESEARCH FIELDS:
NANOPARTICLES
NANOTECHNOLOGY
NANOSTRUCTURED MATERIALS

T&C eurolab
testing & consulting

- Materials technology
- Welding and non-destructive testing
- Industrial metrology



TEC EUROLAB SRL
Viale Europa 40, Campogalliano, Modena, Italy

PVD THIN FILMS FOR TRIBOLOGICAL AND OPTICAL APPLICATIONS

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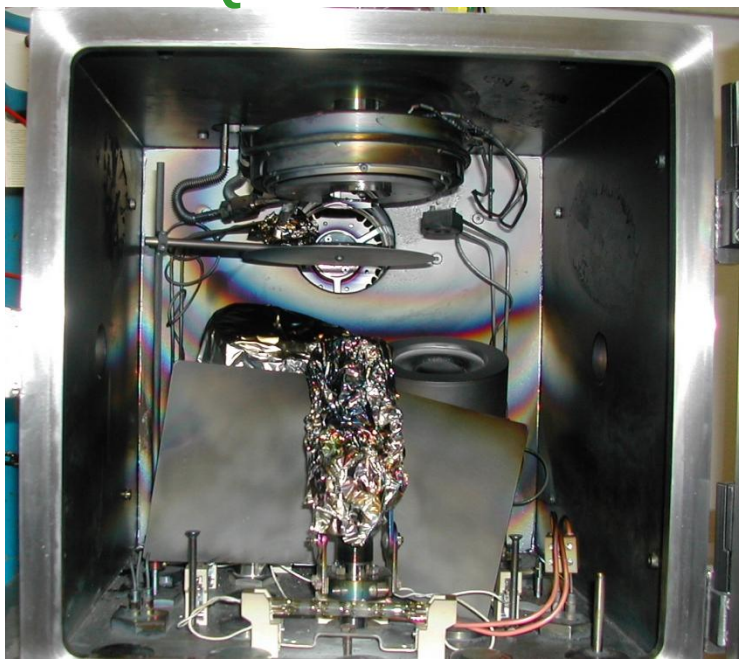
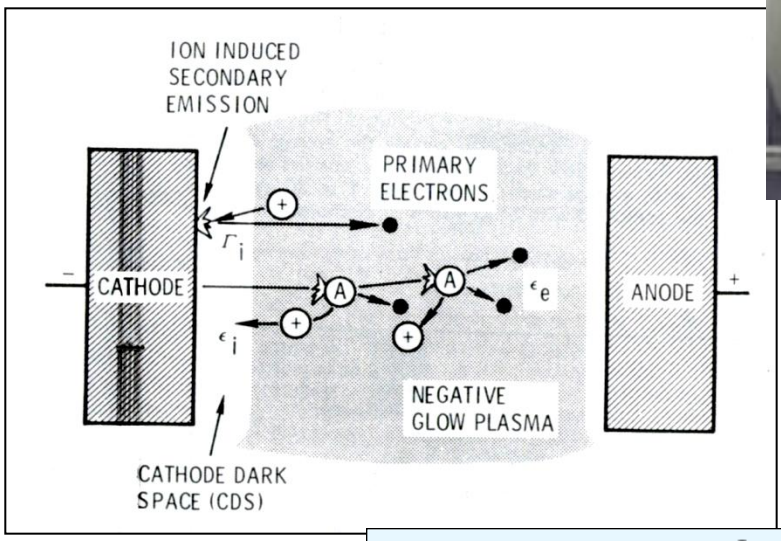
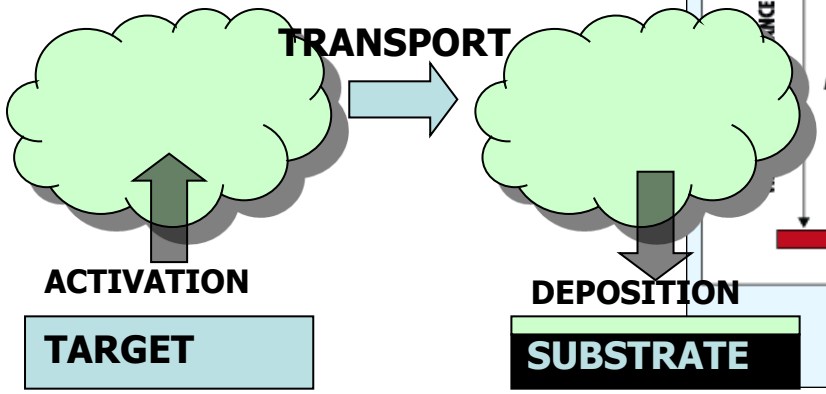
UHV EQUIPPED CHAMBER

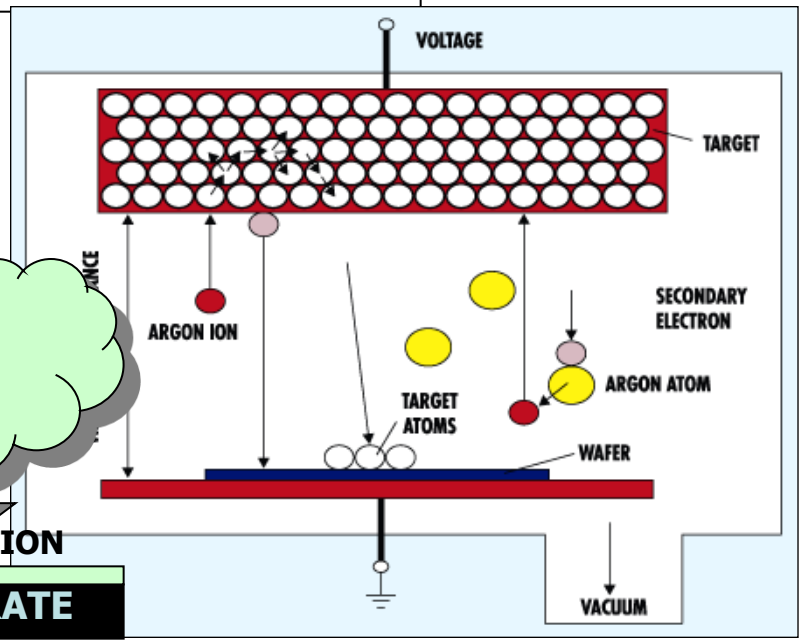




PLASMA ENHANCED PHYSICAL VAPOUR DEPOSITION

DC and RF MAGNETRON SPUTTERING TECHNIQUE





VARVEL & MECVEL PROJECTS: ACTUATORS AND GEAR BOXES

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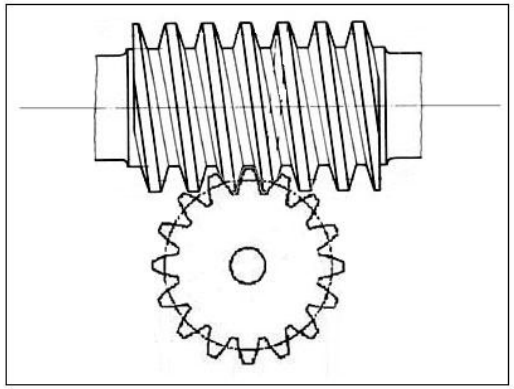
Motoriduttori ed attuatori lineari:
Problematiche connesse ad ATTRITO, USURA E LUBRIFICAZIONE

CALORE
RENDIMENTO
RUMOROSITA'
STABILITA'

CONSUMO
AFFIDABILITA'
LONGEVITA'

INQUINAMENTO
IGIENE



VARVEL & MECVEL PROJECTS: ACTUATORS AND GEAR BOXES

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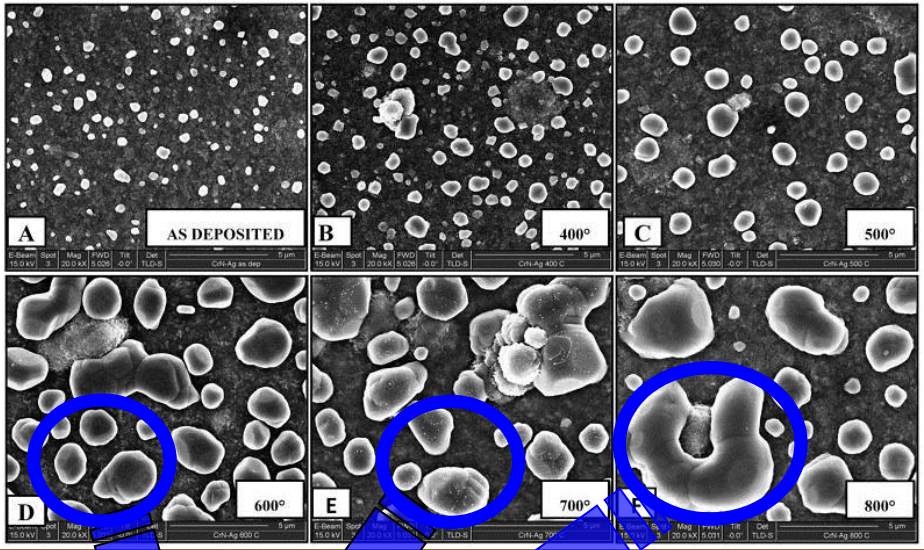
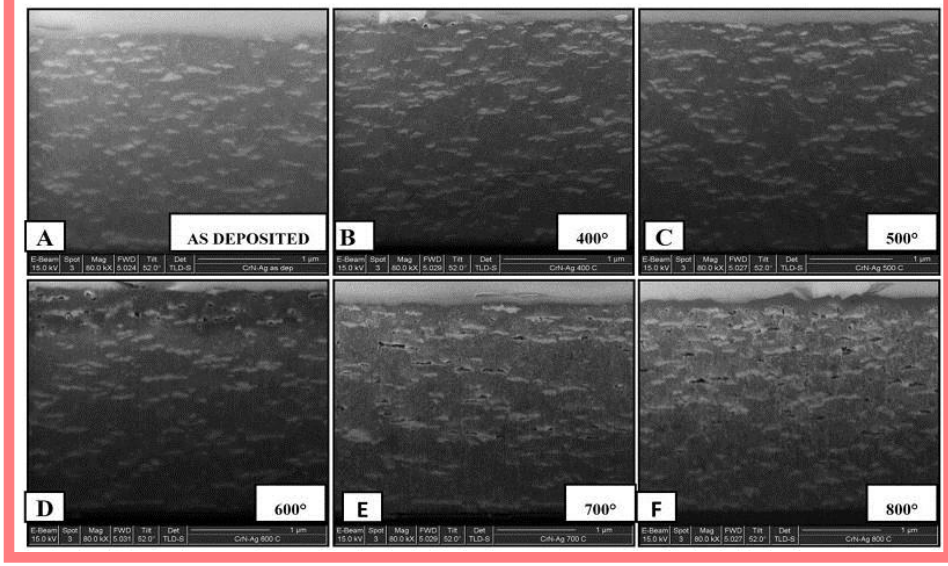
Self lubricant Ag-nanoadditivated CrN multilayered hard coatings

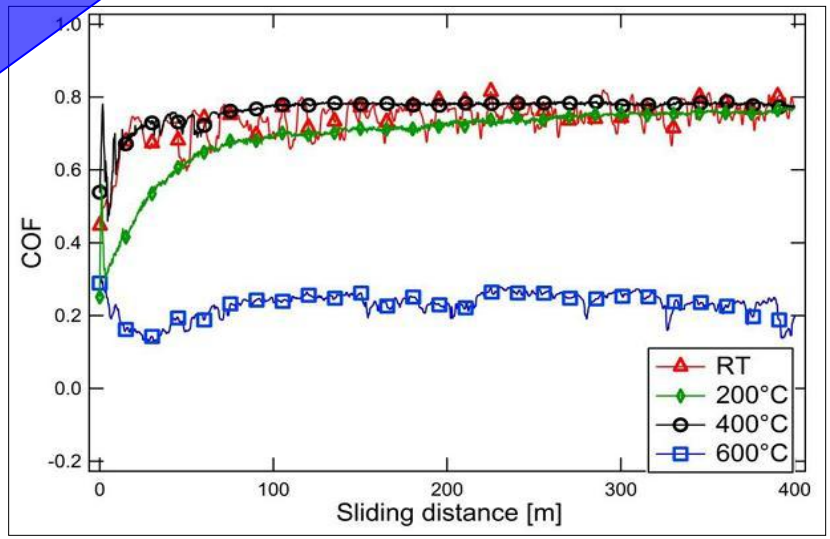
SEM MICROGRAPHY



SEM MICROGRAPHY



Aggregated Ag-clusters on hard matrix guarantee low-friction at high running-in temperature



A STRATEGY FOR OIL-REPLACEMENT

TO PROVIDE CLEAN AUTOLUBRICATED COUPLINGS

BERARMA PROJECT:
VANE PUMPS

Pompe a palette di cilindrata variabile

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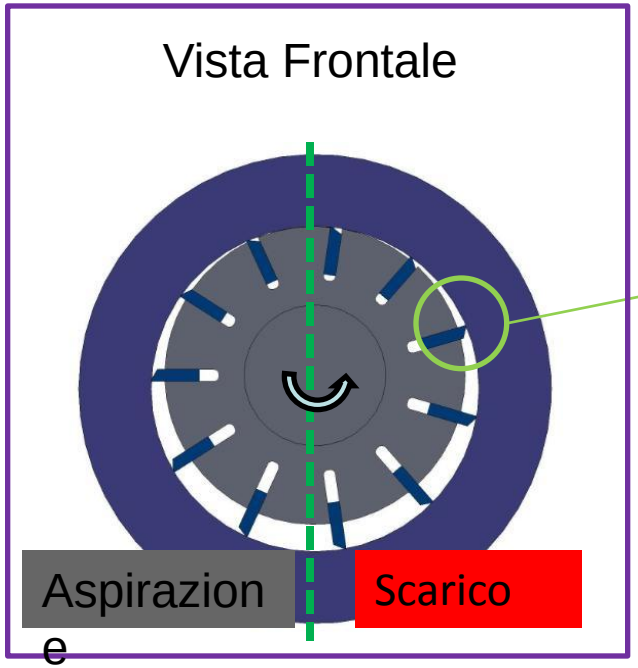
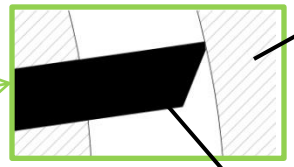


sistema tribologico Palette -Statore



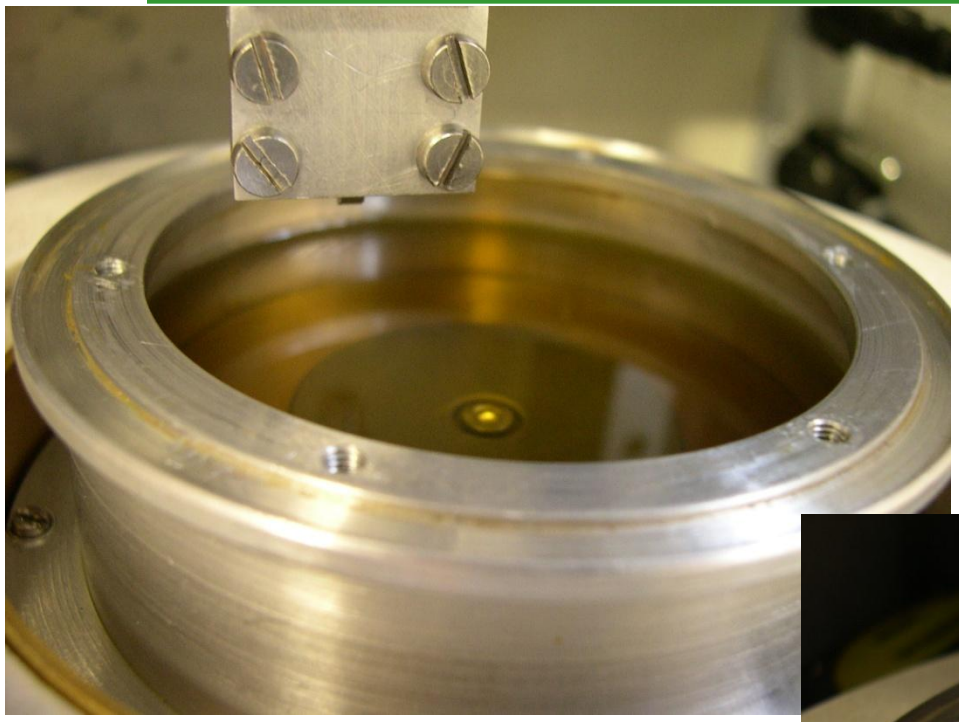
Statore 41CrAlMo7-10+ Nitrurazione
Durezza 1100-1200 HV

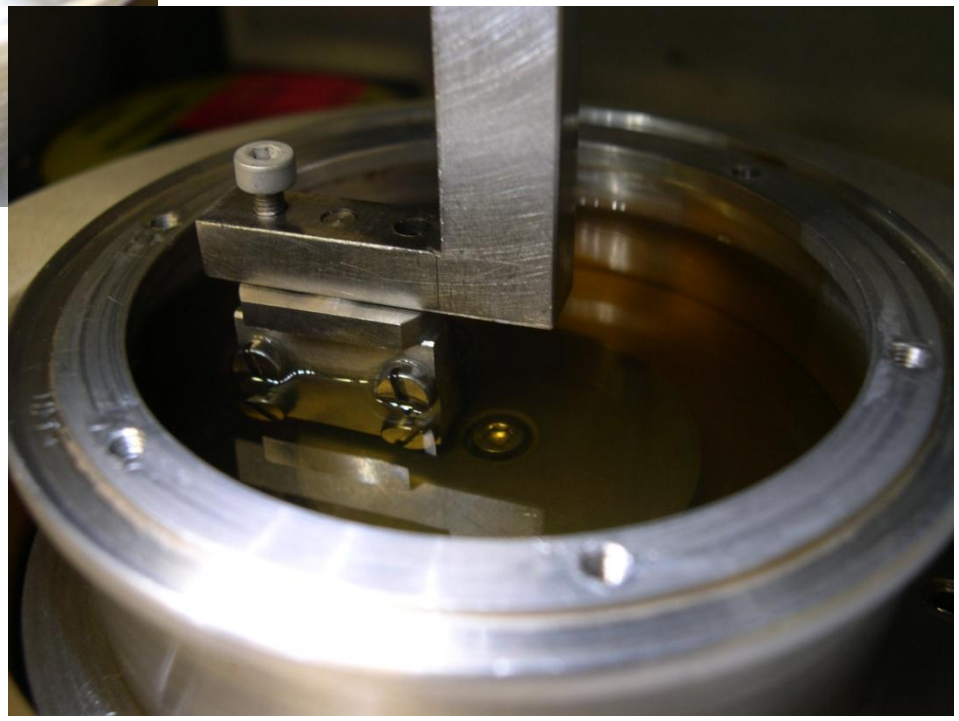
Paletta HS6-5-2C UNI EN ISO 4957 + Tempra
Durezza 61/65 HRC

GOAL:

*Realizzazione, caratterizzazione e ottimizzazione sperimentale rivestimenti superficiali innovativi relativamente ai componenti **palette / statore** e **piastre di distribuzione / rotore**.*

BERARMA PROJECT:
VANE PUMPS





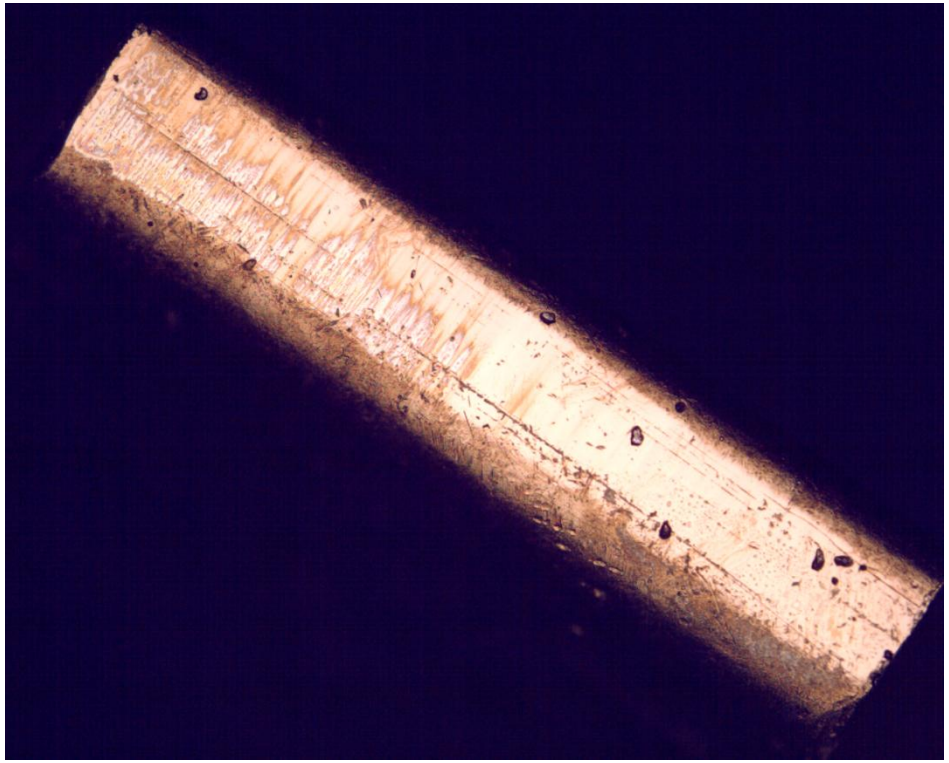
Simulazione al tribometro
In condizioni di
pieno bagno d'olio

BERARMA PROJECT:
VANE PUMPS

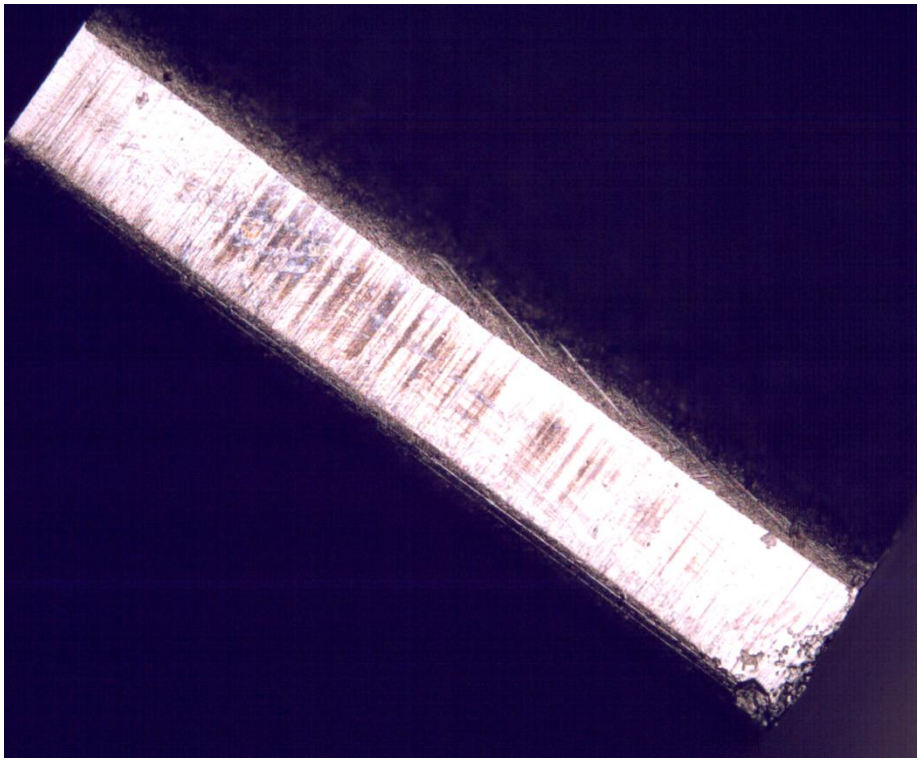
Prove USURA con paletta rivestita di Nitruro di Titanio (TiN) – spessore 3 micron

Palette dopo 5 ore

Carico: 110 N
Durata test: 5 ore



TiN Coating



Acciaio tal quale

GTLINE PROJECT

SCOPI	INVISIBILITA' RADAR INVISIBILITA' INFRAROSSO SCHERMATURA IMPULSI ELETTROMAGNETICI PROPRIETA' ANTIPROIETTILE PROPRIETA' ANTIFIAMMA
STRATEGIE	RIVESTIMENTI OTTICI NANOFILLERS

VALIGERIA TECNICA

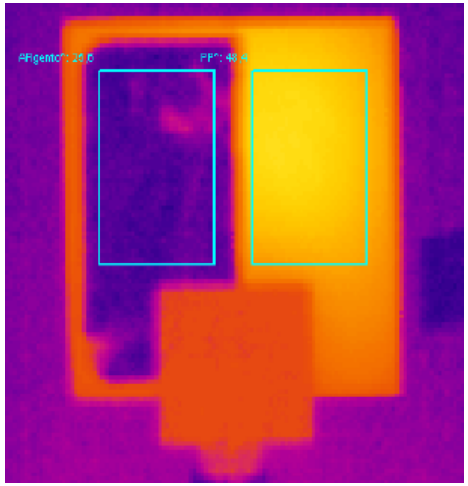
Lab. SUP&RMAN – alessio.passalacqua@unimore.it

GTLINE PROJECT

Schermatura Elettromagnetica

Invisibilità Infrarosso

Rivestimenti metallici micro/nanostrutturati



Conducibilità Superficiale

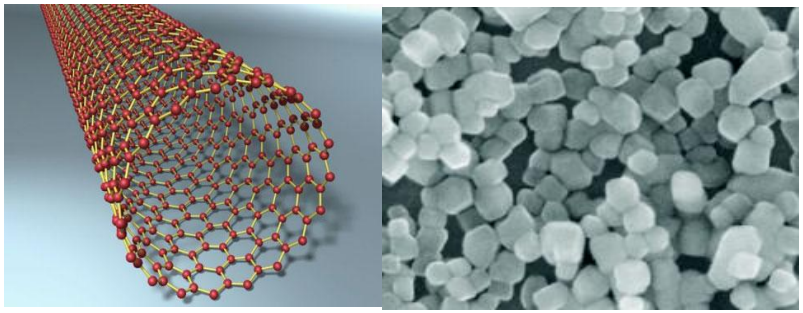
Bassa Emissività

Proprietà Antiproiettile

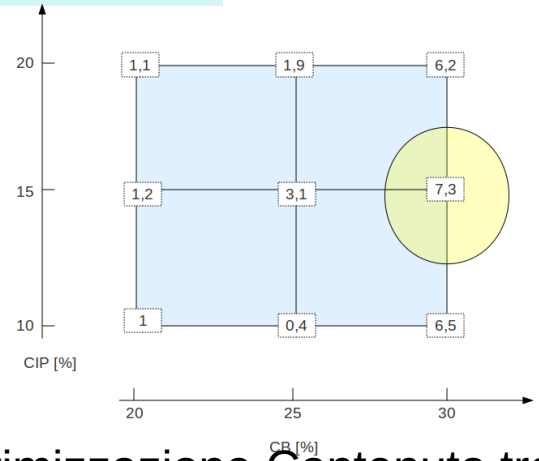
Invisibilità Radar

Micro/nano-additivazioni

Nanotubi e Nanoparticelle



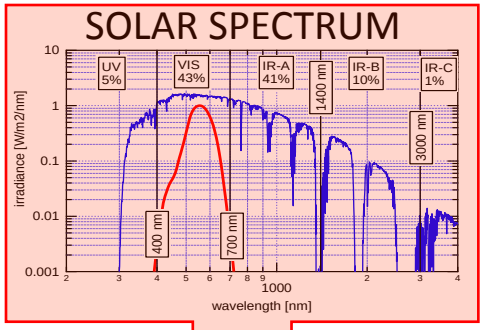
Dissipazione Energia
Resistenza agli urti

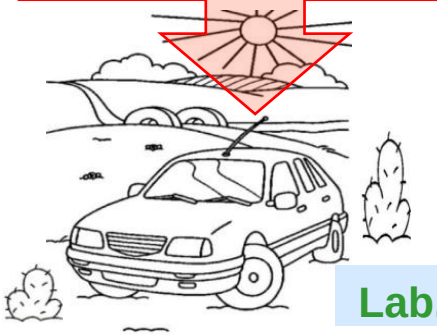


Carbon Black
+
Fe_3O_4

Ottimizzazione Contenuto tramite DoE

LAM PROJECT (concluded)





FILTER COATINGS: a strategy for optimizing the living comfort inside the vehicle

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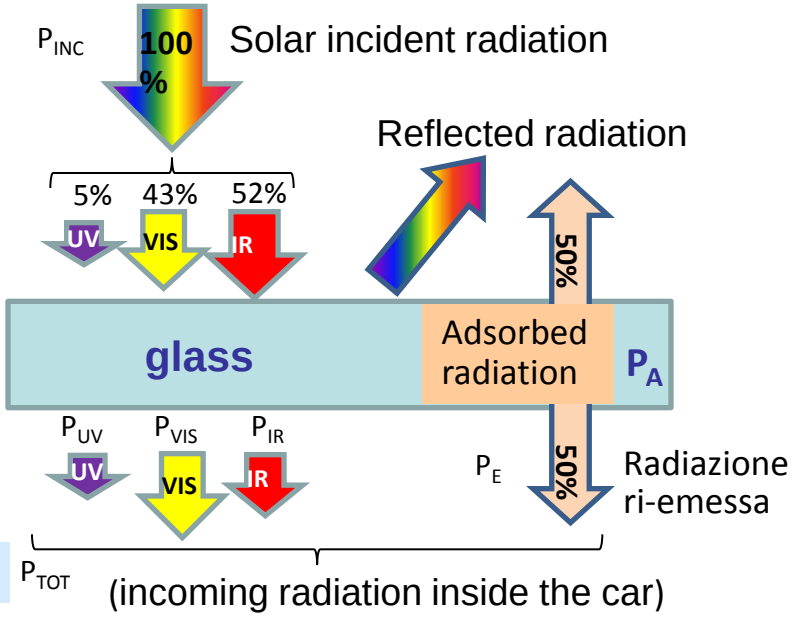
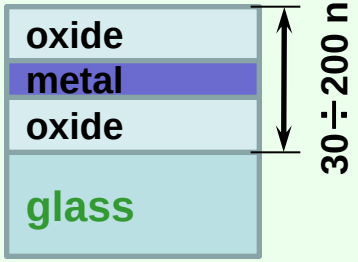
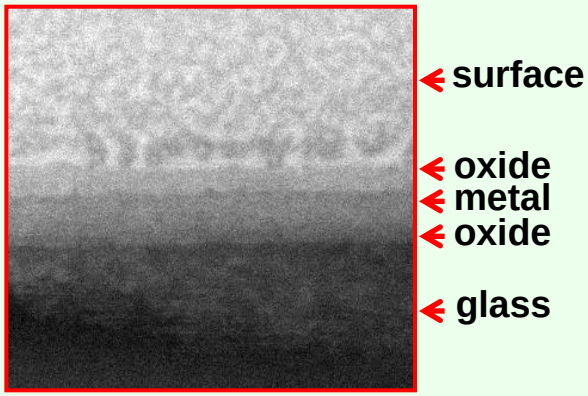
CAR GLASSES: Starting situation



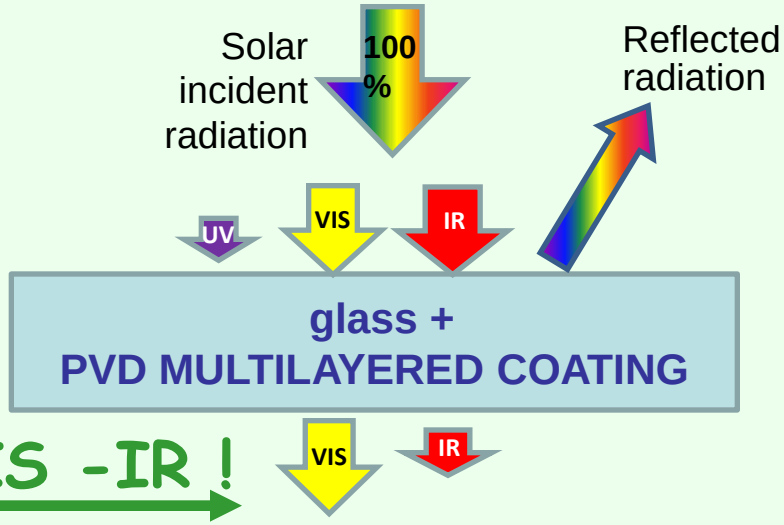
COATING STRUCTURE: DESIGN



REALIZED COATING: CROSS SECTION



CAR GLASSES: Engineered solution



Coating performances depend on layer sequence and thickness

Goal: no UV, +VIS -IR !

LITOKOL PROJECT (concluded)

Materiali per edilizia: Problemi collegati all'usura da esposizione agenti atmosferici

ESPOSIZIONE SOLARE

INGIALLIMENTO MALTE PER FUGHE

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CERAMIC NANOFILLERS:

A UV-ADSORBING STRATEGY