

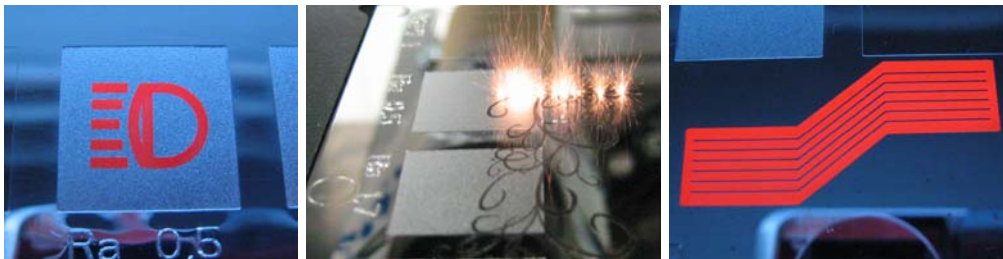
## Laser engraved decoration of PVD coated metal and plastic parts

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## Laser marking and engraving

1. Informative
2. decorative
3. functional



## Laser technology

Nd:YAG and Nd:YVO<sub>4</sub> 1064 nm

- fundamental wavelength
- good removal rate

2nd harmonic 532 nm

- better accuracy
- sensitive materials

## Beam guidance

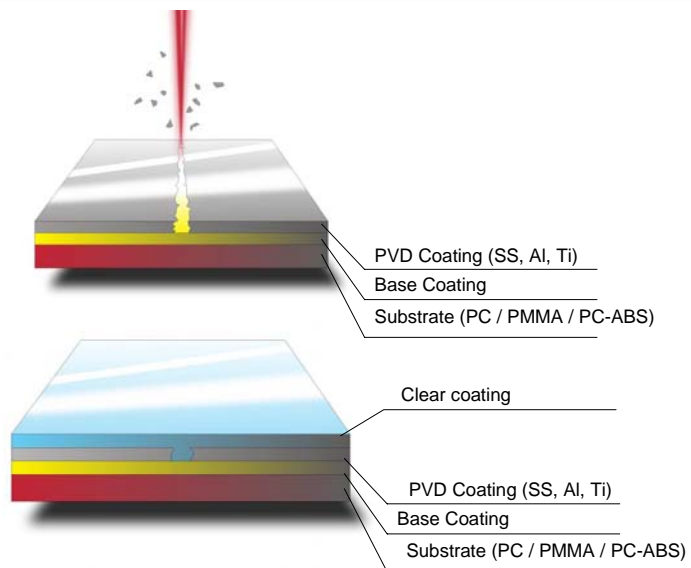
Galvanometer scanner

- speed 0 – 10 m/s
- working area 50 x 50 – 250 x 250
- spotsize 0,015 – 0,5
  
- vector graphics
- raster graphics

## Laser marking process

### Layer removal

- peak power 50-150 kW
- peak intensity  $N^* 1 E7 W/cm^2$
- $P_{AVG} = 1-10 W$
- ablation and evaporation
- limited heat affect
  - upper layer removal
  - intermediate layer removal

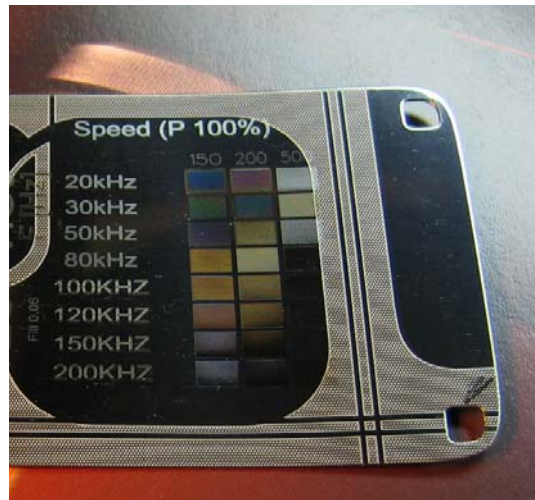


## Laser marking process

Layer forming / re-forming

- low peak power
- low peak intensity
- $P_{AVG} = N * 10 \text{ W}$
- generate or change oxide layer
- colour change
- challenge:
  - process stability
  - thermal load

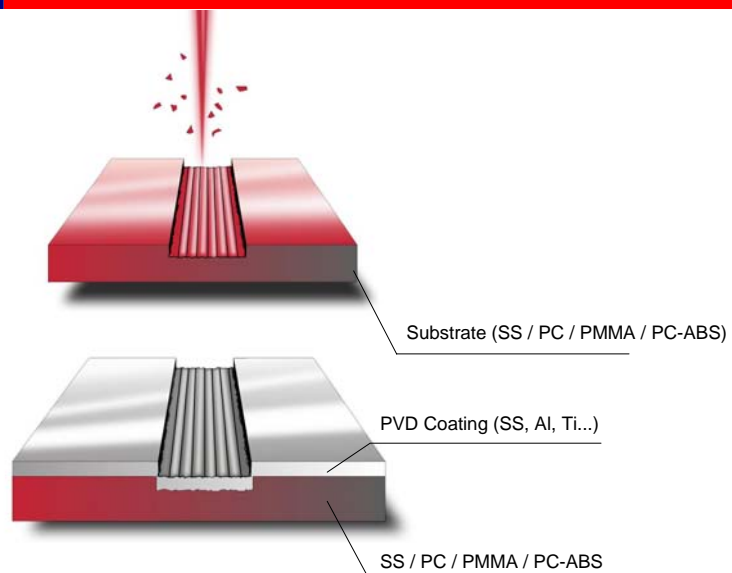
## Oxide forming



## Laser marking process

### Surface structuring

- high peak power - evaporation
- medium  $P_{AVG} = N * 10W$
- metal or plastic surface structured
  - lines or craters
- coating after structuring
- challenge:
  - thermal load on metals
  - cleanliness



## 1. Informative

- controlled coating removal
  - PVD / CVD
  - paint
- buttons, keys (consumer electronics)
- day/night design (automotive)
- advisory texts on surface (consumer electronics)

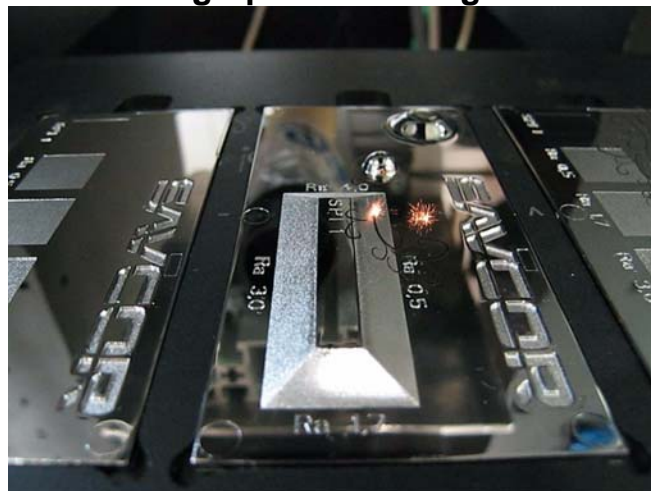
## Lights



## 2. Decorative

- controlled coating removal
  - PVD / CVD
  - paint
- raster graphics
- vector graphics

### Decorative graphics marking



### Decorative vector graphics marking

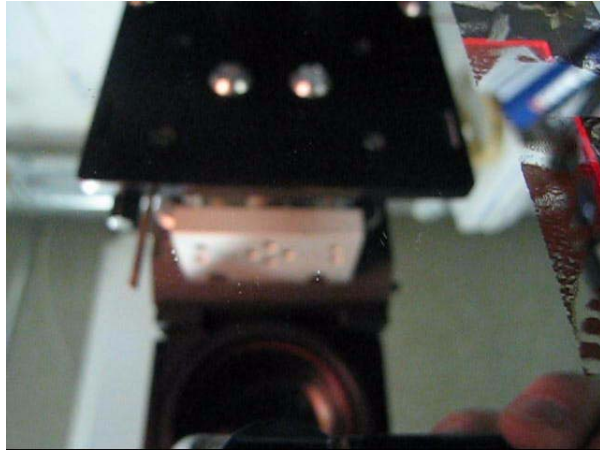


### Vector graphics





### Decorative raster graphics marking



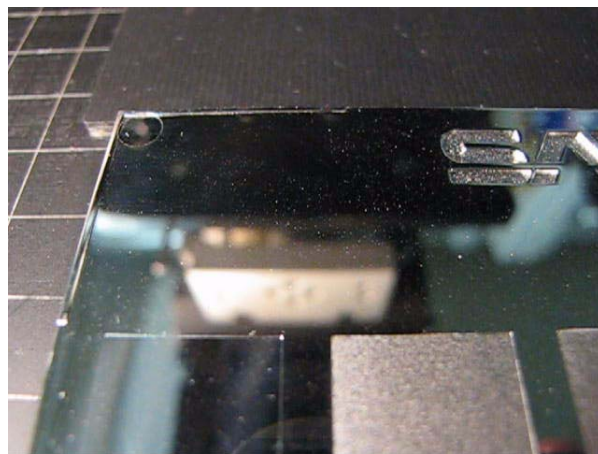
### Raster graphics



### 3. Functional

- controlled coating removal
  - PVD / CVD
  - electrochemical coating
- radiators
- inductances
- capacitances
- connectors
- replacing masking

### Functional elements



## Replacing masking



## Production opportunities

- keys, buttons, day/night designs
- cover decorations
- replacing or correcting masking

**In your  
production  
- soon?**



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