

Budapest University of Technology and Economics
Faculty of Transportation Engineering and Vehicle Engineering

Department of Automobiles and Vehicle Manufacturing

INVESTIGATION OF LASER TREATED COPPER SURFACE LAYER

Miklós Berczeli, József Hlinka, Enikő Réka Fábián, Zoltán Weltsch

33st International Colloquium on
„Advanced Manufacturing and Repair Technologies in Vehicle Industry”

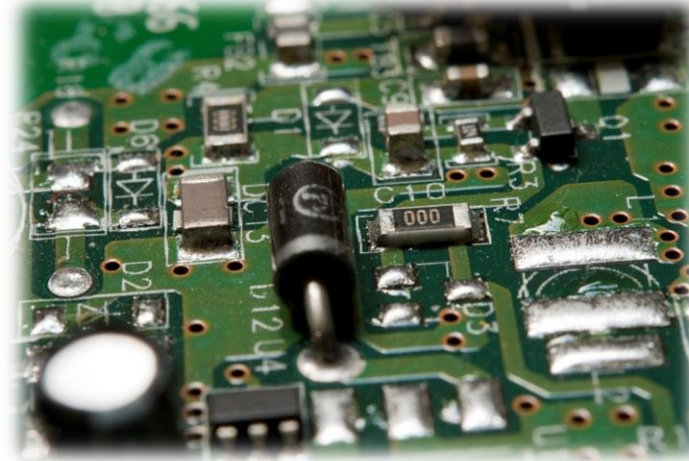
Zuberec, Slovakia, 25-27 May, 2016.



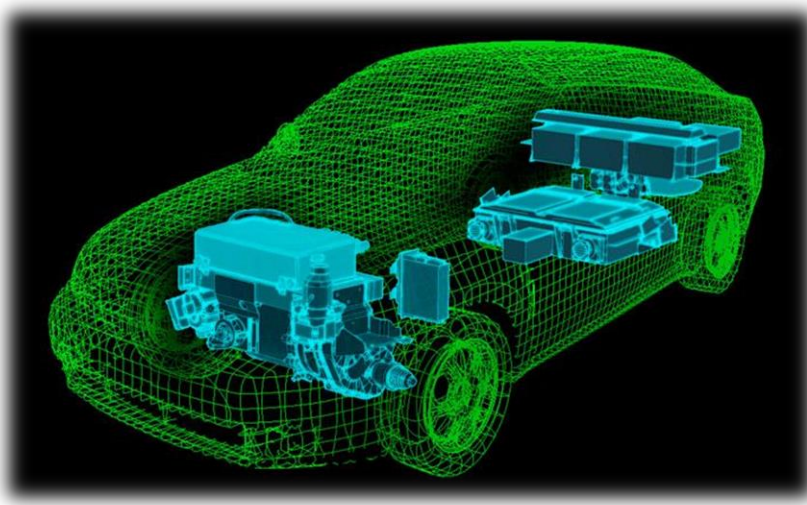
Copper parts in everyday life in vehicles



Ref.:
auto.howstuffworks.com
(2014.11)



Ref.:
commons.wikimedia.org
(2014.11)

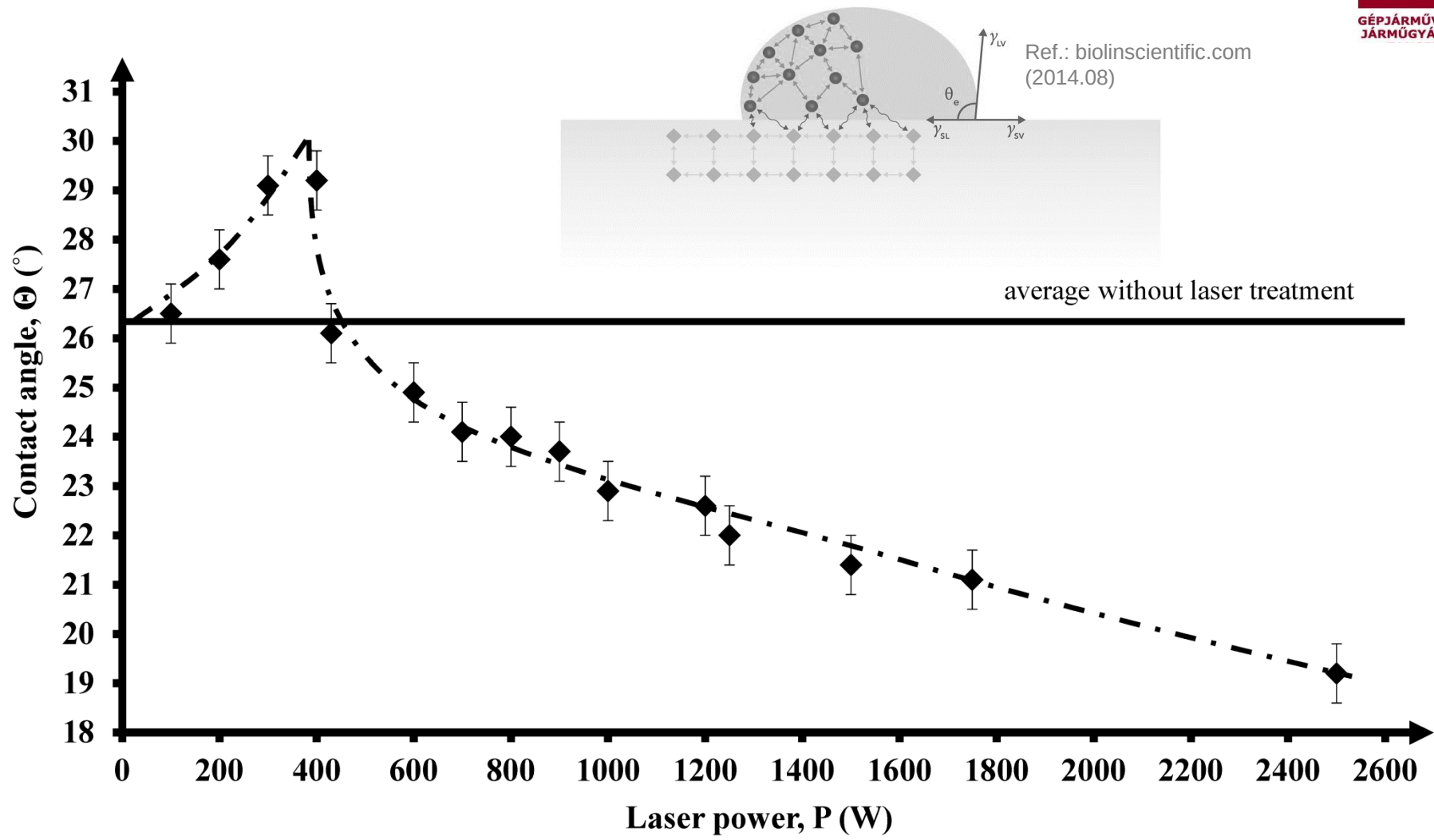


Ref.: upsbatterycenter.com
(2014.11)



Ref.: motortrend.com
(2014.11)

Previous wettability results



- Changing the surface wettability without modifying the surface layer
- Optical metallographic examination of the laser treated copper surfaces
- SEM examination of the laser treated copper surfaces



Ref.: trump-laser.com
(2014.11)

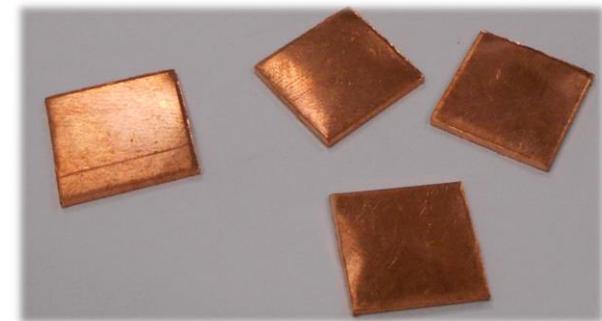
Laser surface treatment

2,5 kW Nd: YAG continous wave laser



Used laser power settings: 300, 600, 900 and
2500 W

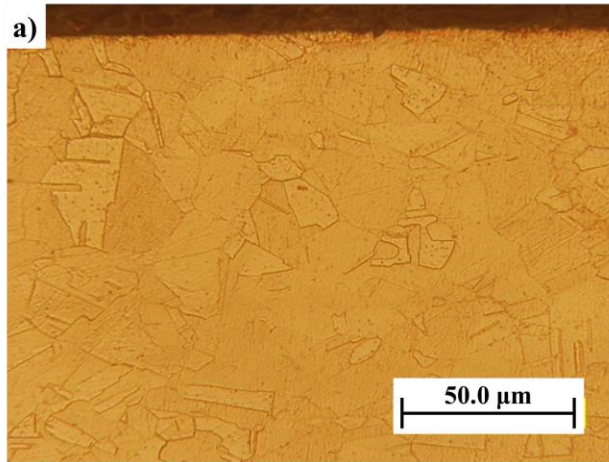
Scanning speed: 500 mm/min
Shielding gas: 12.5 l/min Ar
Laser beam diameter: $\varnothing$ 0.4 mm



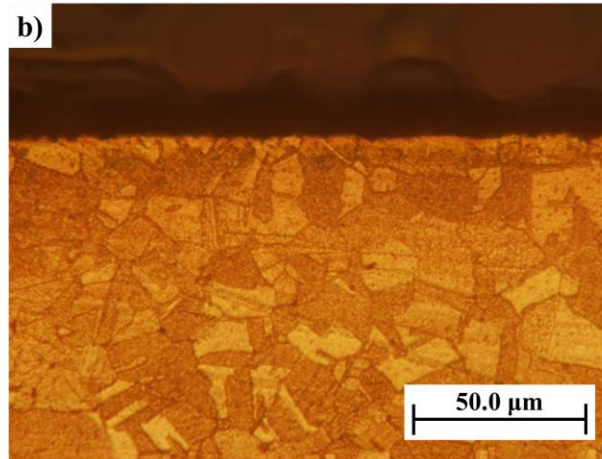
Cu ETP R240 (CW004A)

Optical metallographic measurements

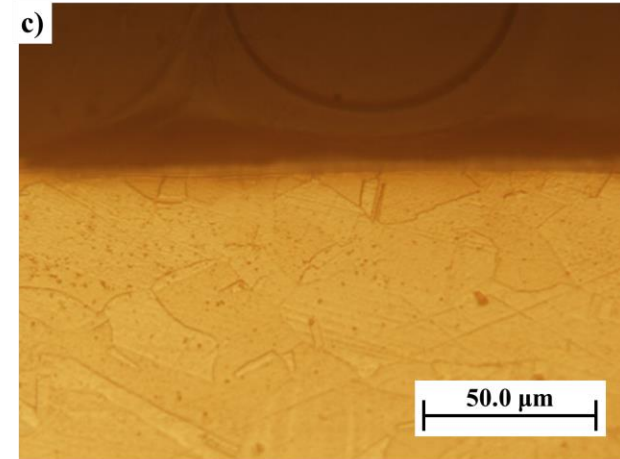
untreated



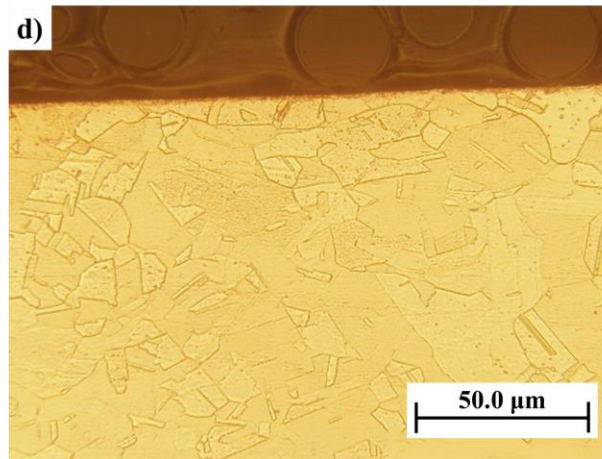
300 W



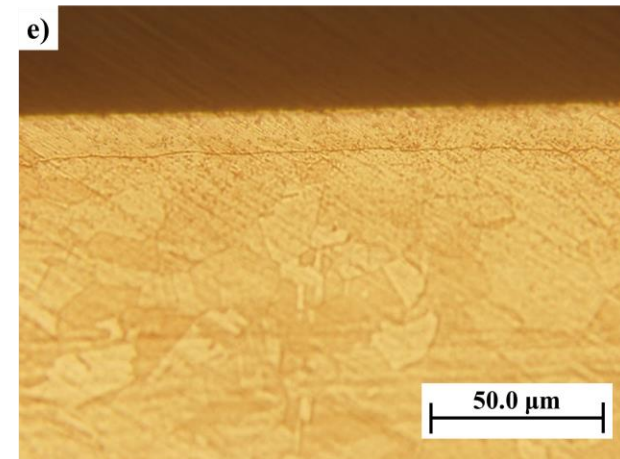
600 W

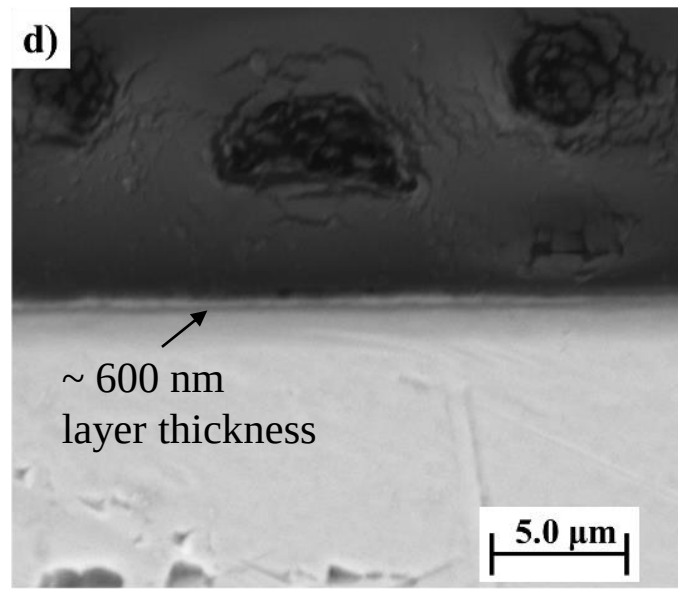
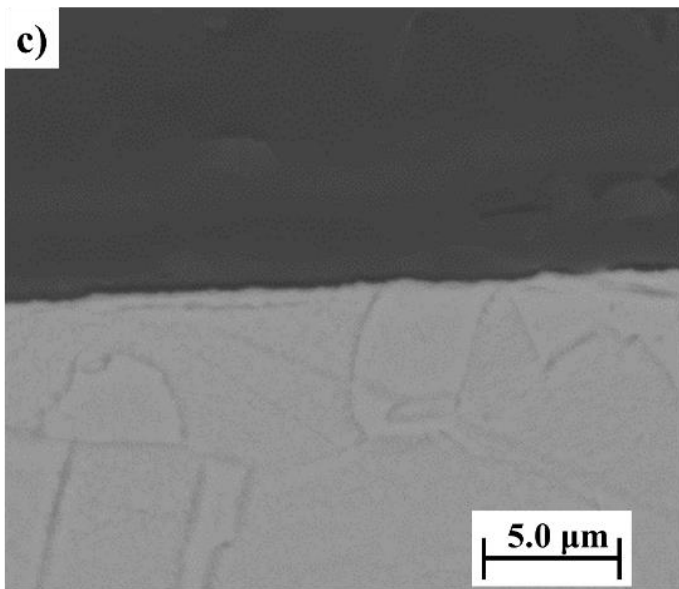
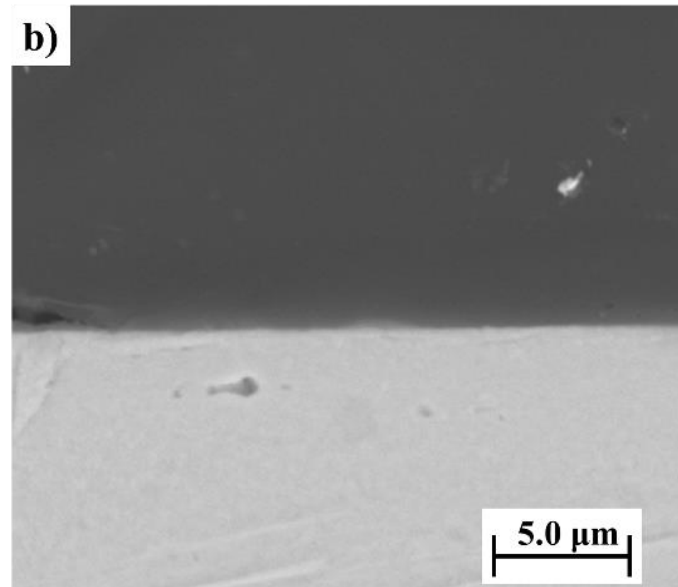
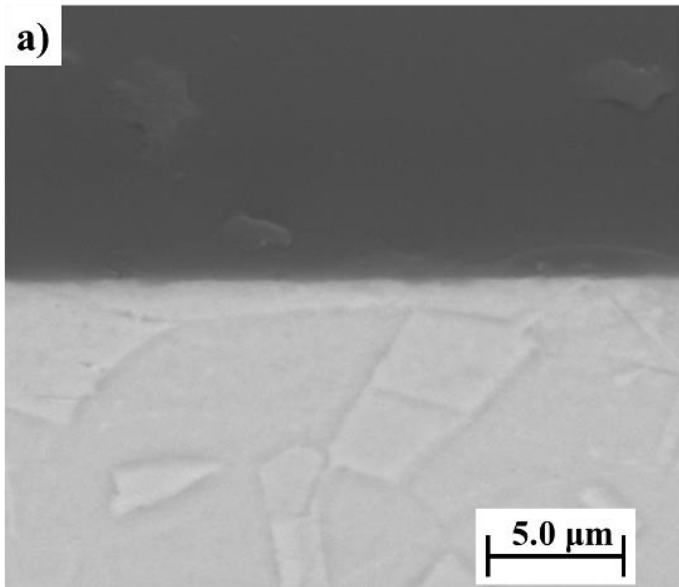


900 W



2500 W





600 W

2500 W

300 W

900 W

- ❖ The effects of laser surface treatments were investigated on copper surface layer using a continuous wave Nd: YAG laser. Our previous studies showed that the surface energy and the wettability have changed after the surface treatment. Our purpose was to change the wettability without changing the surface topography.
- ❖ It was shown by optical microscope and SEM that there was no change of the surface topography in the system up to 2500 W laser power. Measurements were found no change on the microstructure.
- ❖ Based on the investigations we can conclude that with these laser parameters if anything was changed on the surface layer, it is below 1 μm .

Acknowledgements

The publication of the work reported herein has been supported by National Talent Programme, Ministry of Human Capacities, Human Capacities Grant Management Office (EMET) (the contract number NTP-HHTDK-15-0009). The project is implemented by BME Faculty of Transportation Engineering and Vehicle Engineering.



Investigation of Laser Treated Copper Surface Layer

Thank you for your attention!



***Budapest University of Technologies and Economics
Department of Automobiles and Vehicle Manufacturing***