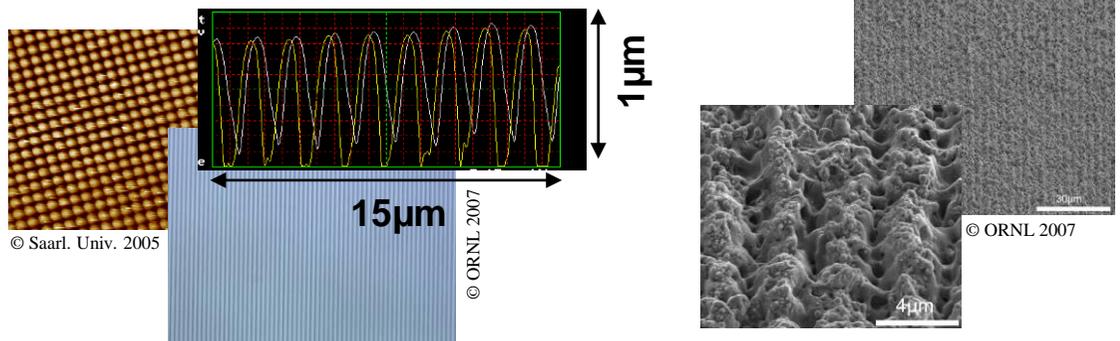


Advanced Laser Structuring Facility

Revolutionizing large surface's behavior through small features

ORNL has setup an Advanced Laser Structuring Facility in which interfering high-power laser beams provide a 2-dimensional periodic high-speed thermal or chemical treatment to surfaces. This leads to a direct structuring with perfect long-range ordered periodicity. Up to 50,000 lines or 2 billion dots can be created at a surface within a fraction of a second turning ordinary surfaces into multi-functional composites and chemical structures. The feature sizes are nanoscaled, the feature spacing ranges from 0.2 to 50 μm while the structured area of a single shot lays in the range of mm^2 to cm^2 .

With this system it is possible to functionalize material's surfaces by manipulation of the topography, the phase-microstructure, the texture, the residual stress situation and the formation of new phases being utilized in automotive and industrial applications and for tissue engineering and biomedical devices.



Resulting properties in micro-nano-composite structure

- electrical / thermal conductivity
- wear resistance
- hardness
- stiffness / toughness
- composite effect
- adhesion

Metrics

- Spacing: 0.2 – 50 μm
- Density: 200 – 50,000/cm
- Feature size: 1 – 500nm
- Velocity up to: 50,000 lines at a time
2 billion dots at a time
135 cm^2/sec .

Applications

Automotive Industry, Electronic Industry, Industrial Manufacturing, Space Applications, Biomedical Applications

Example accomplishments

- Doubled the life time of cutting tools
- Reduced electrical resistance of contacts by a factor of three
- Increased the life time of electrical connectors by a factor of five
- Control of cell growth direction on artificial surfaces

Point of Contact:

Claus Daniel, Ph.D.
Materials Processing Group
Materials Science and Technology Division
Oak Ridge National Laboratory
P.O. Box 2008, Oak Ridge, TN 37831-6083
Phone: 865-241-9521
FAX: 865-574-4357
E-mail: danielc@ornl.gov

