Ion Beam Etching (IBE) in Surface Finishing

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Applications:

- Geometry and size modification of wires
- Sub-nanometer smoothing of optical surfaces
- Materials surface treatments and analysis

IBE-Method

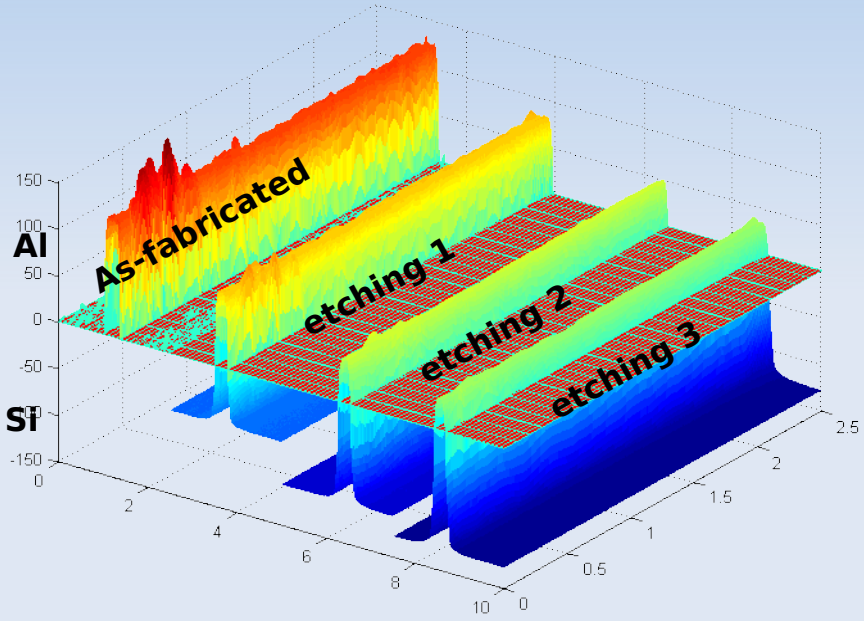
Conventional ion etching:

- Energetic, heavy ions transfer kinetic energy to target atoms initiating atom movements
- Cleaning, smoothing and re-arrangement of the surface
- High doses results surface roughening

Additionally ion beam etching provides:

- Surface smoothing by dynamically changing directional beams.
- 3D etching capabilities
- Wide energy and intensity range is available for energy deposition form material surface to shallow interfaces

Wires and Films

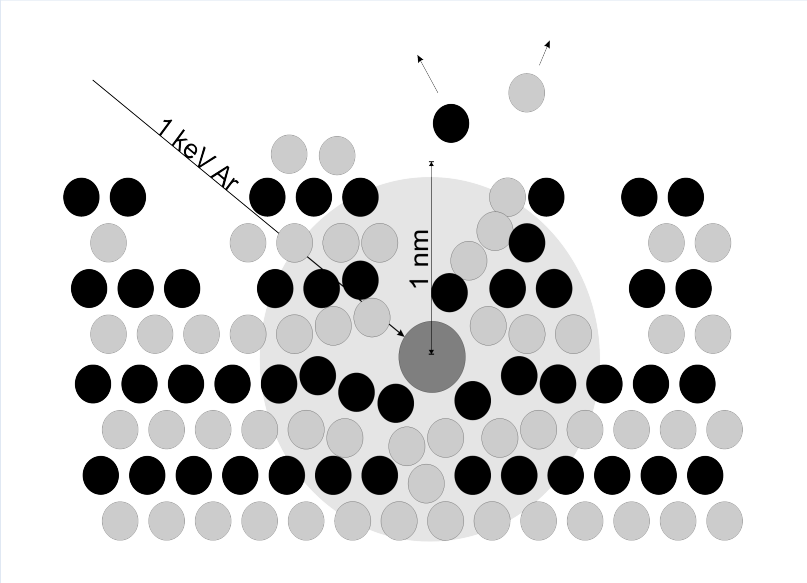


Kuva 1. Ionbeam etched Al-wire on Si-substrate.
M. Zgirski, K.-P. Riikonen, V. Touboltsev, P. Jalkanen, T.T. Hongisto and K. Arutyunov ”Ion beam shaping and downsizing of nanostructures”, Nanotechnology 19, 055301 (2008).

- Cross section of the wire is reduced
- Roughness reduction found
- Final geometry is determined by initial conditions
- Outcome is depended on the material and its phase

Thin Film and Wire Applications

- High intensity pulses with narrow energy distribution can be used for confined annealing
- High energy beams for interface mixing for better adhesion
- Phase change to amorphous or micro-crystalline



Macroscopic surface treatments

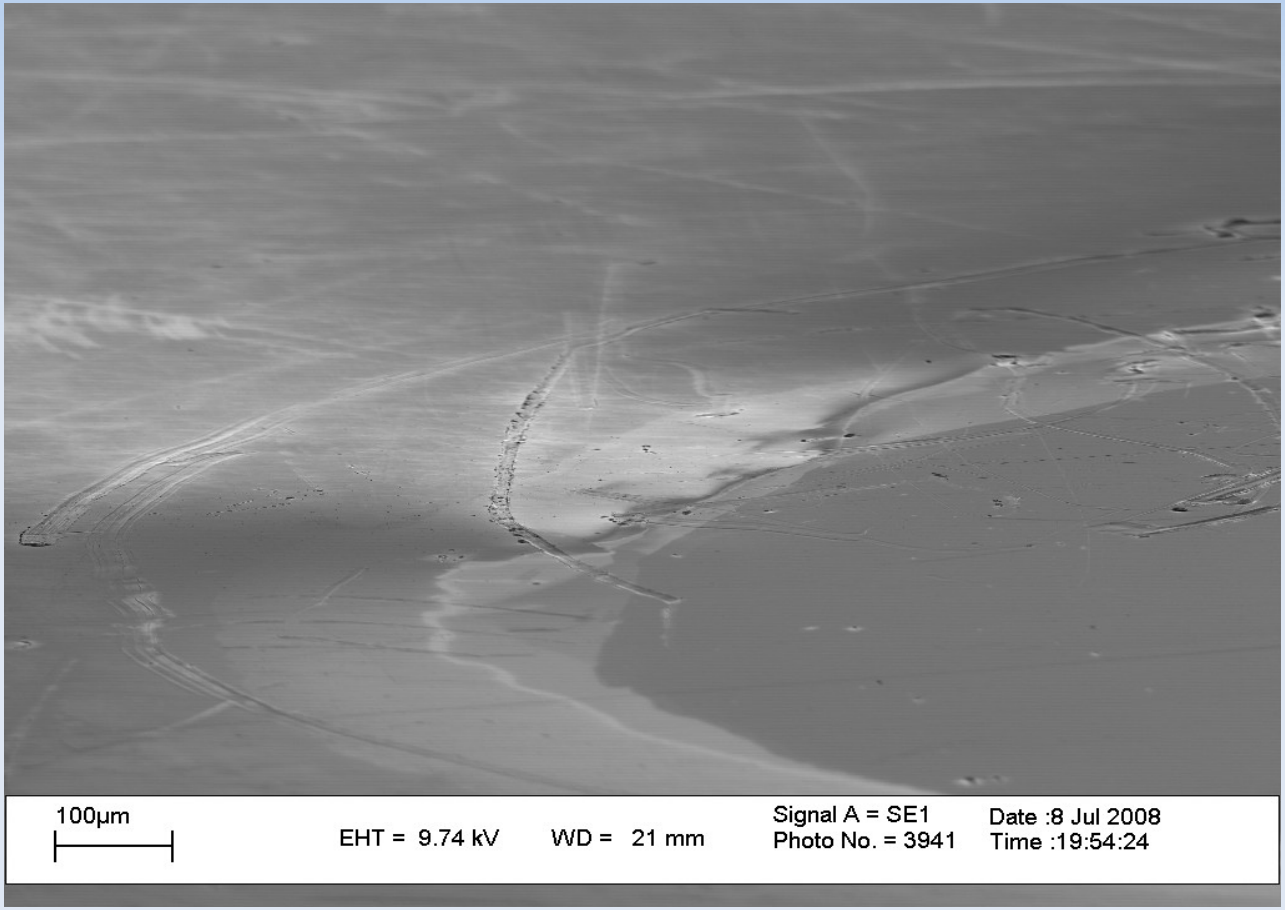
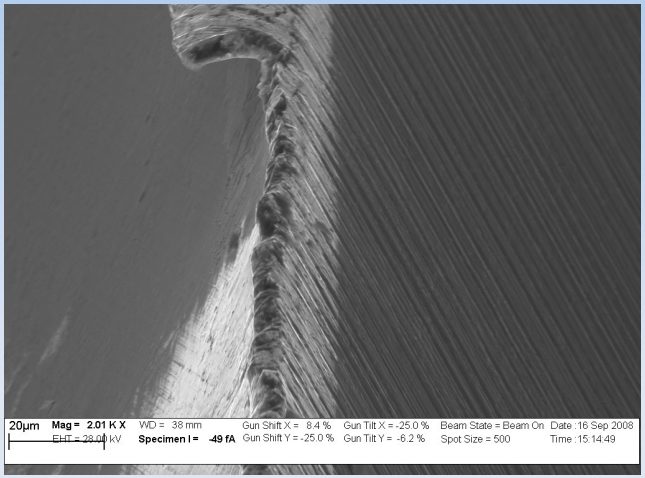
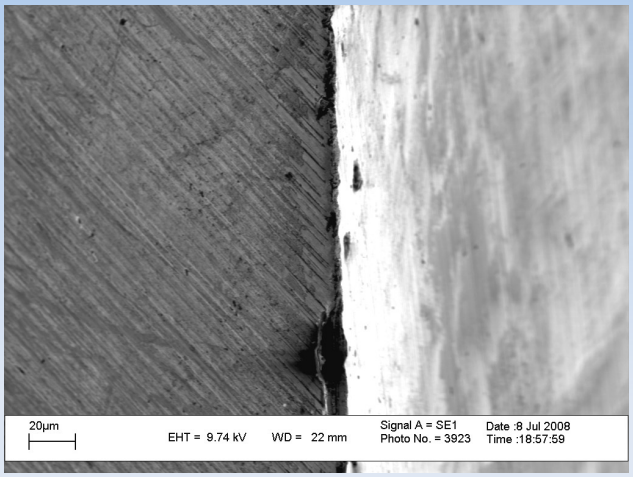


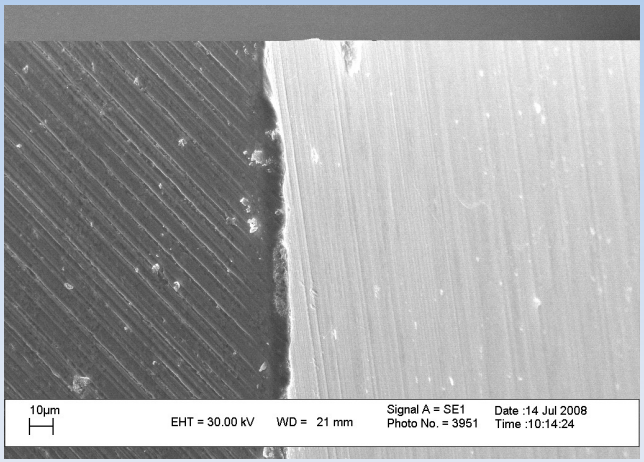
Figure 3. Border region between non etched and IBE steel surface. (OSKE-project 2008)

- Surface cleaning and smoothening
- High intensity pulses of nitrogen provides hard and corrosion resistant surfaces
- Crystallinity can be revealed by surface etching

Directional IBE Applications







Figures 4 a-c. Hanging ridge on the rapid steel edge a) and b). A detail of a damaged part of the edge c).(OSKE-project 2008)

- Directional etching for sharp edge fabrication
- Better adhesion of coatings by surface cleaning and smoothening