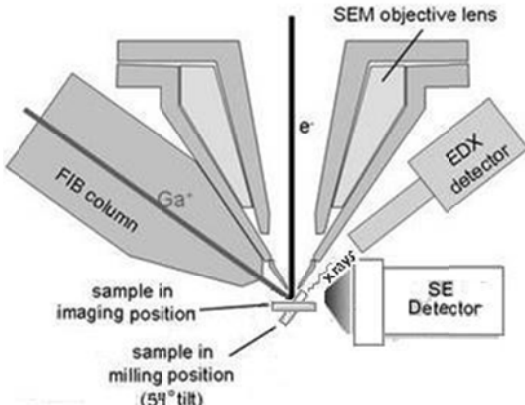
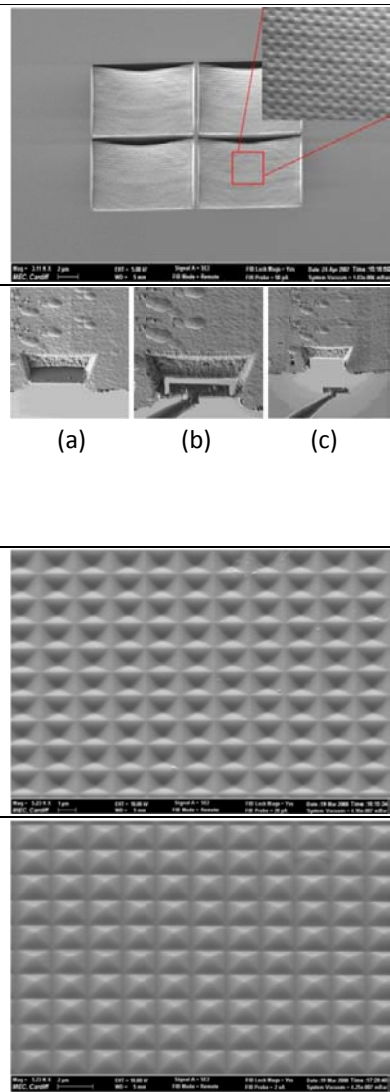


# Micro Nano Patterning

## FIB/SEM Crossbeam XB1510

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<b>Material class:</b>	Silicon X	Polymer X	Metal X	Ceramic X	Glass X	Organic X	Other
<b>Short technology description:</b>	 <p>The system consists of a GEMINI® field emission gun electron column and a high performance CANION focused Ga+ ion beam (FIB) column mounted 54° from the vertical.</p> <p>The system allows machining of complex 3D structures through ion sputtering and/or gas assisted etching and deposition utilising novel data preparation techniques (Raith Elphy Quantum lithography software, which enables using GDSII data format).</p>						
<b>Typical structures and designs:</b>	 <p><b>2x2 array of Moth's eye lenses</b>                  – 10x10x2 μm + Ø150x50 nm (SiO2)</p> <p><b>TEM/STEM lamellae preparation using FIB in milling and deposition mode</b>                  (a) a thin wall left between two milled trenches                  (b) micro-manipulator needle soldered to the thin wall                  (c) cutting the branches that hold the wall and manipulation of the lamellae (CrC PVD coating on tool steel; x3500)</p> <p><b>12x12 arrays of concave rectangular pyramids</b>                  – 2x2x1 μm (Si)</p> <p><b>12x12 arrays of convex rectangular pyramids</b>                  – 2x2x1 μm (Si)</p>						

<b>Special features:</b>	<ul style="list-style-type: none"> <li>- High resolution live imaging during milling, deposition or etching</li> <li>- Compositional analysis (EDX)</li> <li>- TEM sample preparation tool kit</li> <li>- Scanning transmission electron analysis (STEM)</li> </ul>
<b>Limitations, constraints:</b>	<ul style="list-style-type: none"> <li>- Positional accuracy 0.5 <math>\mu\text{m}</math></li> <li>- Min. feature size 30 nm</li> <li>- Aspect ratio 3:1</li> <li>- Surface roughness 5 nm</li> <li>- Part size app. 100 mm</li> <li>- Removal/deposit rate 0.5 <math>\mu\text{m}^3/\text{s}</math></li> </ul>
<b>Material examples:</b>	<ul style="list-style-type: none"> <li>- Metals, e.g. Ni and Ni-alloys, Ti, Co</li> <li>- Amorphous alloys, e.g. Ni-Si-P-B</li> <li>- Ceramics and glasses, e.g. SiO<sub>2</sub>, CrC, Glassy Carbon, Diamond</li> <li>- Single crystals and materials for nano-electronics, e.g. Si, ZnO, GaAs</li> <li>- Polymers, e.g. PMMA, PTFE</li> </ul>