Automated handling and assembly of customizable AFM-tips - DTU Orbit (27/12/2018)

Automated handling and assembly of customizable AFM-tips

Today's processes in micro- and nanofabrication include several critical dimension metrology steps to guarantee device performance. Especially in the manufacturing process of novel disruptive photonic devices and nanoelectronic circuit architectures, new 3D acquisition and visualization techniques for metrology are required. Two of the most important parameters are the line width and sidewall roughness of vertical interconnects and nanooptical structures. The measurement of these parameters becomes increasingly challenging as the continuous shrinking of dimensions requires higher lateral resolution. The AFM has become a standard and widely spread instrument for characterizing such nanoscale devices and can be found in most of today's research and development areas. However, the characterization of three dimensional high-aspect ratio and sidewall structures is still a bottleneck. Novel exchangeable and customizable scanning probe tips, so-called NanoBits, can be attached to standard AFM cantilevers offering unprecedented freedom in adapting the shape and size of the tips to the surface topology of the specific application. In order to realize the in-situ exchange of NanoBits within the AFM environment the NanoBits have to be provided in a freestanding way that allows the AFM cantilever to be aligned and connected to the NanoBits. Due to the fact that direct microfabrication of such structures is still challenging, a nanorobotic preassembly of NanoBits cartridges is reasonable. These cartridges are intended to contain several NanoBits with a variety of different tip-shapes.

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