Mechanical Nano-Lithography Over Double Layer Chalcogenide Resist

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Surface patterning techniques are constantly developing in accordance with the increasing requirements of nano-electronics, plasmonics, nano-medicine and other novel technologies. Nano-lithography with a solid tip driven by scanning probe microscope is a low-cost and versatile technique, which could be applied as a separate operation in some technological cycles or for direct patterning of functional elements for leading-edge devices prototypes. Scanning probe lithography could be applied in materials of different nature (organic, metals, dielectrics) and in variety of ambient (vacuum, liquid, normal atmosphere). Microscope, in this case, used both for surface pattering and controlling of recorded patterns.

We realized mask-production process based on mechanical patterning of double layer chalcogenide resist. The first layer consists from the 5-15nm of a soft material and second layer has a thickness necessary for a lithographic mask formation (50-200nm). Pattern inscribed in a first layer and following selective wet etching process used to translate pattern into a second layer. This approach allows controlled patterning with minimal width of lines near 60nm. Features of smaller sizes (near 5-10nm) could be inscribed after resist quality optimization and improvement of etching process.

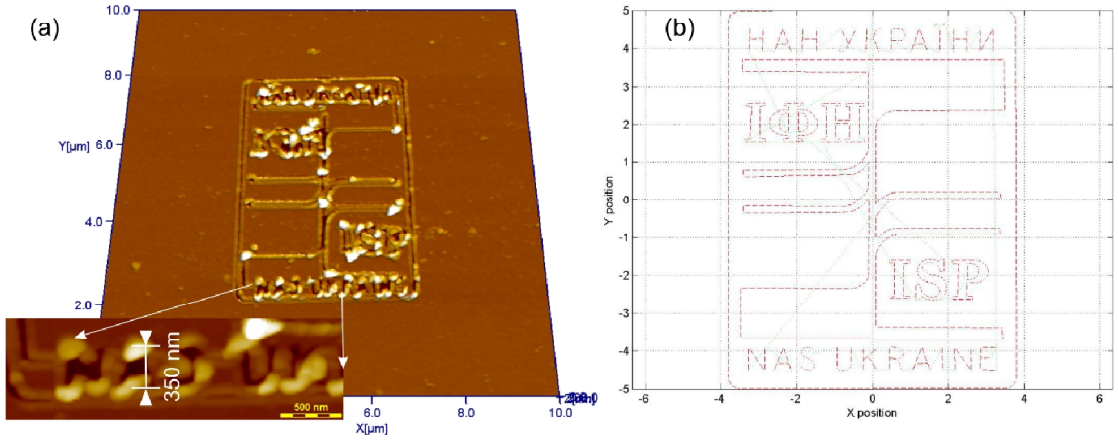

Fig.1. Atomic force microscopy image of the inscribed (a) and programmed (b) pattern of ISP NASU logo.