

NIL stamp modification utilizing focused ion beams

H.D. Wanzenboeck, S. Waid, E. Bertagnoli

Vienna University of Technology

The fabrication of nanoimprint lithography (NIL) stamps with features in the sub- μm range is currently a bottleneck of the NIL technology¹. The conventional fabrication method is based on electron beam lithography in combination with etching. With a target feature size of 22 nm on 2x2 inch substrates the production of the stamp master is time-consuming, costly and also prone to errors. An error on the master is replicated on the daughter stamps (working stamps). The replication of errors on NIL stamps places a major challenge on the reusability of masters.

In this work reports on an approach to modify NIL stamps with a focused ion beam (FIB)². FIB technology was employed to modify prestructured NIL stamps made of various materials such as quartz, silicon and nickel. In this work repair strategies for NIL stamps will be discussed. Excess material from stamps has been removed by ion milling. Using beam induced deposition also defects of missing material have been corrected. The optimization of processes towards smallest feature size will be reported.

The capabilities and limitations of FIB as repair technology for NIL stamps will be discussed. Moreover, FIB-modification of stamp masters provides NIL with a optimization tool to experimentally test the effect of different aspect ratios, side wall slopes and complex stamp geometries on a single mask.

1 Landis S, Chaix N, Gourgon C, Nanotechnology 17 (10), 2701 (2006)

2 Sun HW, Liu JQ, Chen D, Gu P, Microelectronic Eng. 82 (2), 175 (2005)

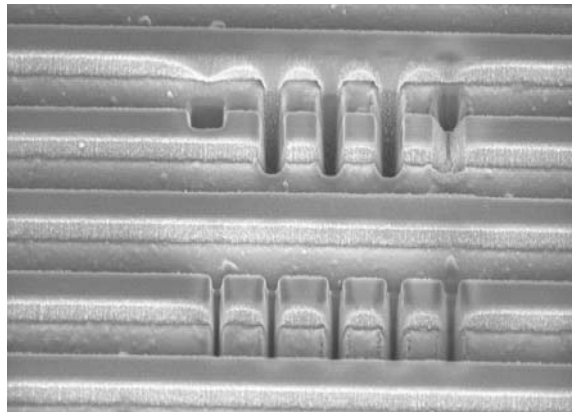


Fig 1: NIL master design modified by FIB milling

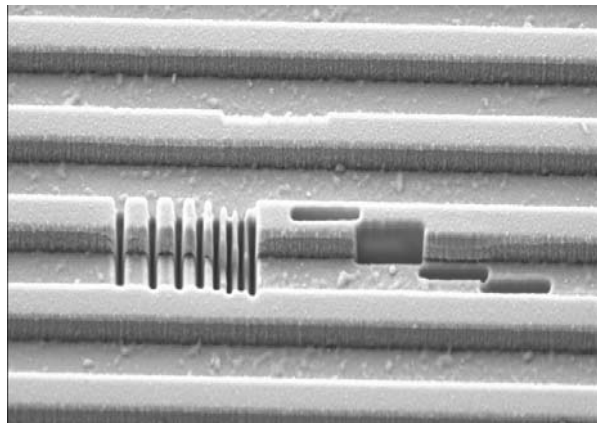


Fig 2: NIL master design modified by FIB milling