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IT-13-P-1915 Advances in ex situ lift out

Giannuzzi L. A.¹

¹ExpressLO LLC

Email of the presenting author: lucille.giannuzzi@expresslo.com

The focused ion beam (FIB) ex situ lift out (EXLO) technique for scanning/transmission electron microscopy (S/TEM) specimen preparation was historically the first lift out technique developed [1]. EXLO is well known for its ease, speed, and reproducibility, and is perfectly suited for manipulation of electron transparent specimens to carrier devices developed for in situ S/TEM testing as shown in figure 1a. Using EXLO for manipulation to a conventional carbon coated grid limits the specimen from being further FIB milled and inhibits certain S/TEM techniques. The development of a patent pending grid design and technique called EXpressLO™ allows EXLO and manipulation without needing a carbon film support [2-4]. The specimen is lifted out and manipulated directly to a slotted S/TEM grid surface such that the specimen may be directly analyzed and/or further FIB milled, broad beam ion milled or plasma cleaned. Using this new grid design, a specimen can also be manipulated easily into a backside orientation which avoids curtaining artifacts after further FIB milling [3]. The Xe+ ion plasma FIB (PFIB) is capable of producing electron transparent specimens for S/TEM [5]. The EXpressLO™ method can also be used for manipulating large PFIB prepared specimens as shown in figure 1b where a 50 micrometer long specimen is manipulated to a grid [6]. The 1 micrometer thick PFIB specimen manipulated to the EXpressLO™ grid can be further milled using conventional Ga+ ion FIB or a PFIB. EXLO is now flexible and continues to be fast and reproducible which saves labor and FIB instrumentation time, ultimately reducing the cost per specimen.

References:

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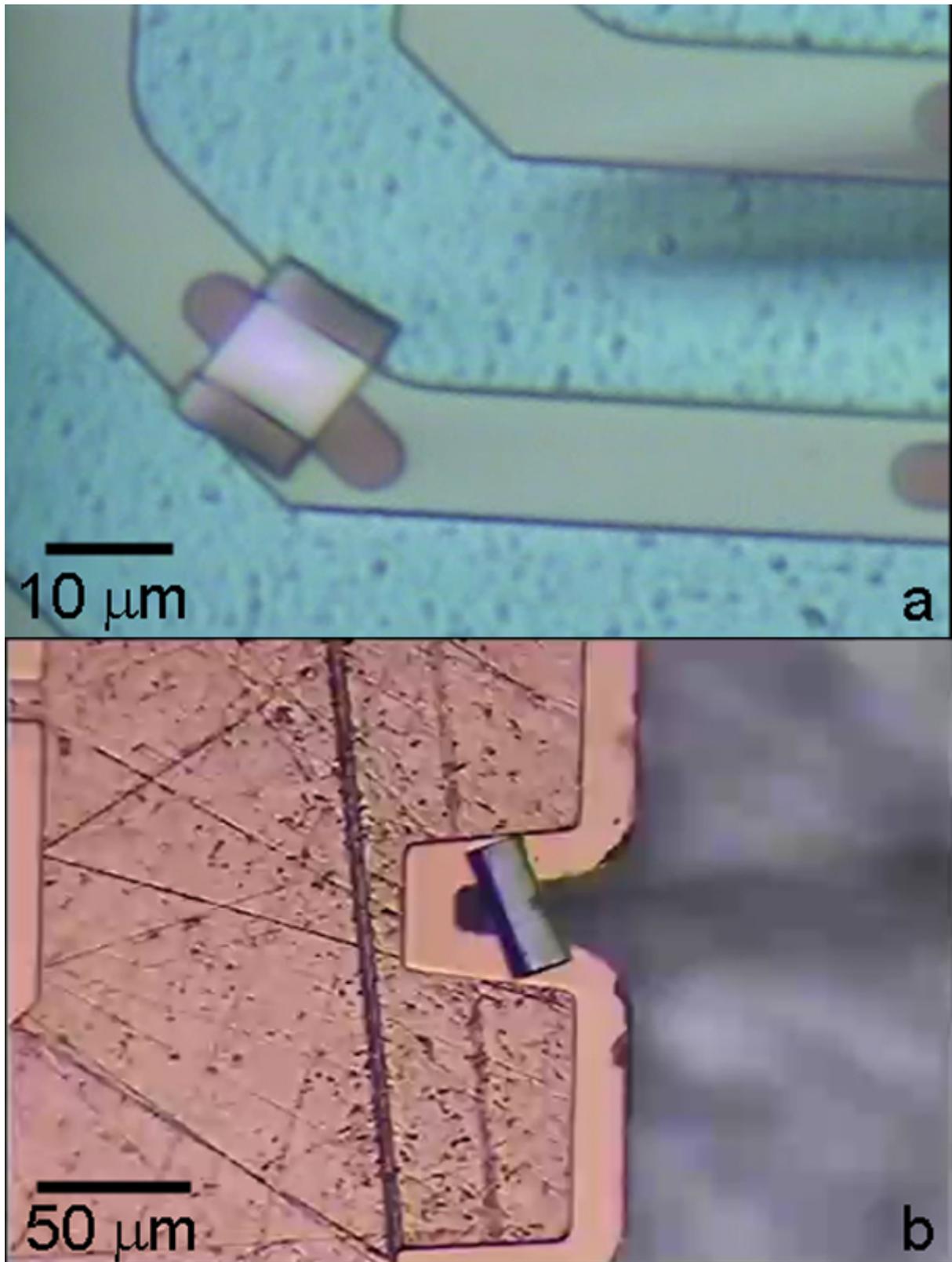


Fig. 1: (a) electron transparent specimen manipulated to a DENSsolution in situ carrier device via EXLO. (b) PFIB specimen manipulated via EXLO using the EXpressLO™ method and grid.