## Fabrication of a new free standing resolution standard for focusing ion beams to sub 100nm dimensions

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With recent advances of nuclear microscopy, proton beam writing and the availability of nano-probe facilities it is becoming increasingly important to have good resolution standards. We present here a new way of producing free standing resolution standards which can be used for high and low beam currents.

Earlier resolution standards fabricated using proton beam writing in the negative resist SU8 followed by Ni electroplating, were optimised for high current (PIXE and RBS) applications [1]. These standards exhibited superior features compared to commercially available resolution standards: However, these standards were mounted on a silicon substrate, were relatively thick (10 microns) with a 130 nm side wall slope projection, and therefore not suitable for transmission studies or sub 100nm focusing. In a new approach we have used PMMA positive resist, which has several advantages. Firstly the removal of PMMA is easier compared to SU8, and therefore thinner 2 micron thick free standing resolution standards can be produced using proton beam writing in PMMA followed by Ni electroplating. According to SRIM [2] calculations these thinner standards will give rise to an edge width of less then 10 nm. A second advantage is the high resolution properties of PMMA resist using proton beam writing compared with accelerated resists such as SU8. These features allows us to fabricate superior standards suitable for a wide range of ion beam techniques eg PIXE, RBS, IBIC, secondary electron detection, scanning transmission microscopy and proton beam writing. In this paper we will discuss the fabrication and the performance of these free standing Ni grids.

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