

Variation of field of view according to Si deflector shape in a microcolumn

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In a microcolumn, electron beam is deflected by deflection voltage applied to the deflector electrodes, and deflectors are usually composed of molybdenum rods¹ or Si electrodes.² Either Mo rods with ~500 μm diameter or equal size Si electrodes are usually arranged symmetrically around the optical axis as shown in Fig. 1.³

We have fabricated a modified Si deflector by changing the size of deflector electrodes. In this case, the size of Si electrode is not equal. Four electrodes denoted as L are large (the angle is 60 degree) and the other four denoted by S are small (the angle is 30 degree) as shown in Fig. 2(a). Fig. 2(b) is the photograph of the fabricated modified Si deflector.

We have tested characteristics of the modified Si deflector by assembling a microcolumn adopting this deflector, and applying deflection voltage either (a) to the four small Si electrodes or (b) to the four large ones. During the operation, the un-biased electrodes are remained grounded. Fig.3 shows the preliminary result of SEM images of 2000 Cu mesh obtained by a microcolumn adopting the modified Si deflector with the same deflection voltage. The field of view of a microcolumn using a large electrode is about more than 2 times wider than the field of view of a microcolumn using a small electrode. Additional influence of electrode size on the field of view will be discussed.

¹ E. Kratschmer, H. S. Kim, M. G. R. Thomson, K. Y. Lee, S. A. Rishton, M. L. Yu, S. Zolgharnain, B. W. Hussey, and T. H. P. Chang, *J. Vac. Sci. Technol. B* 14, pp3792-3796, 1996

² H.S.Kim, Y.B.Lee, S.W.Choi, H.W.Kim, D.W.Kim, S.J.Ahn, T.S.Oh, Y.H.Song, B.C.Park, and S.J.Lim, *Jpn. J. Appl. Phys.* 56, 06GA02 (2017)

³ H.Kim, C.H.Han and K.J.Chun, *Jpn. J. Appl. Phys.* Vol. 42 (2003) Pt. 1, No. 6B, pp. 4084–4088

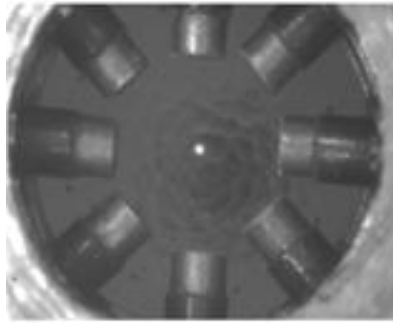


Figure 1: Conventional Mo deflector

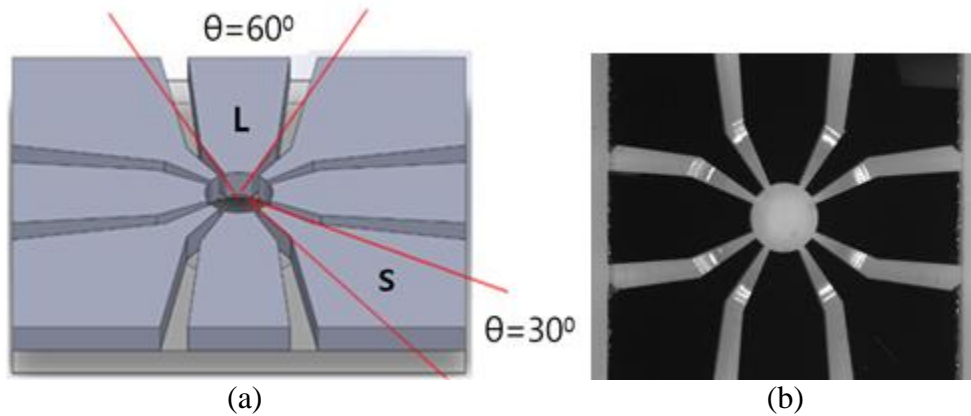


Figure 2: (a) Schematic diagram of the modified Si deflector, (b) Fabricated modified Si deflector

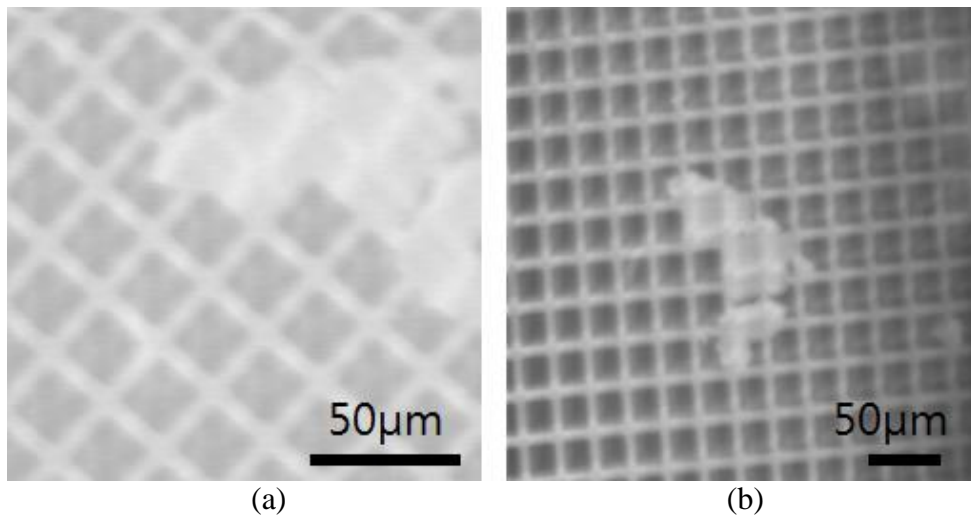


Figure 3: SEM images of 2000 Cu mesh obtained by a microcolumn adopting the modified Si deflector with the same deflection voltage. (a) Deflection voltage is applied to four small electrodes (30 degree), (b) Deflection voltage is applied to four large electrodes (60 degree)