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An improved construction of electron biprism holder for the C2-aperture

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1. Summary

New biprism holder construction has the following advantages:

- **smaller dimensions achievable**
- **reduced risk of flashover**
- **only one contacting point**
- **easier assembly**

2. Motivation

A new microscopy phenomenon – circular dichroism in TEM [1] – would be measurable using Möllenstedt electrostatic biprism [2] placed in the second condenser (C2) aperture plane. The biprism holder used in Philips CM-series microscopes for electron holography, i.e. biprism placed in the selected-area diffraction (SAD) plane, has a tip with dimensions of 5.2 mm x 2.5 mm in cross-section. The maximum allowed dimensions for the biprism holder in the C2 plane are 4.0 mm x 2.2 mm. A simple shrink of dimensions of the SAD holder is not possible, because such a holder is hardly manufacturable. A new holder construction, presented in this poster, is necessary. Additionally, the new construction has the advantages listed in section 1.

3. Principle of biprism operation

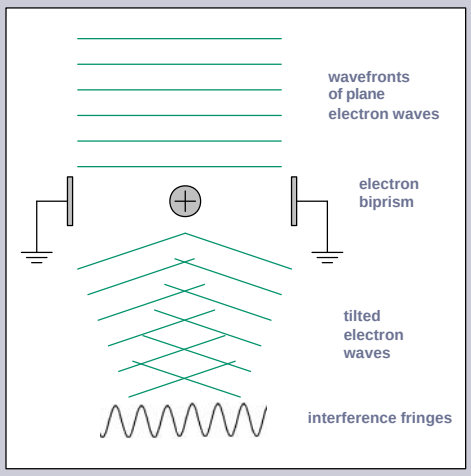


Fig. 1 Electron biprism consists of a thin (diameter ~500 nm) glass fiber coated with gold. The fiber is placed between two grounded plates 1 mm - 2 mm apart. Positive voltage on the fiber deflects the electron waves so that they can interfere.

4. Old construction of the holder tip

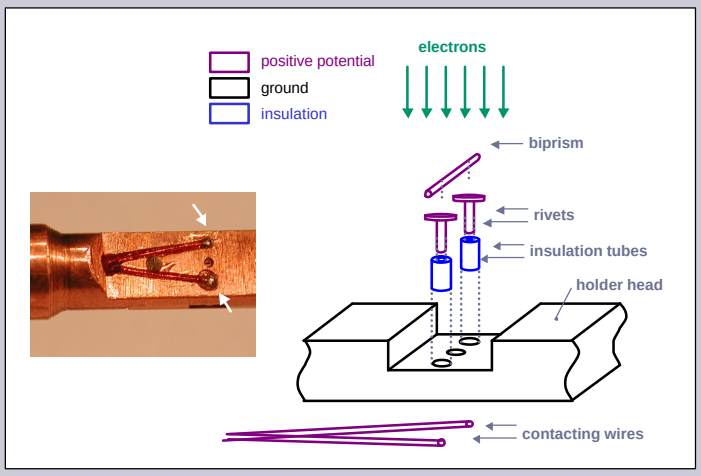


Fig. 2 The biprism is soldered by means of a silver paste on 2 rivets glued into insulation cylinders. The holes in the holder, necessary for the isolation, weaken the stiffness of the holder, which is only 1 mm thick at the biprism. Each rivet is contacted on the bottom of the holder with a thin wire. The wires lie in the grooves at the bottom of the holder. Flashovers often happen at the contact points between the wires and the rivets at the bottom of the holder – marked with the white arrows in the photo.

5. New construction of the holder tip

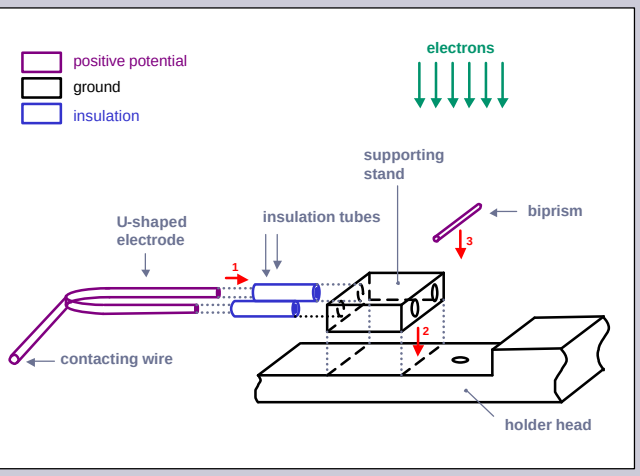
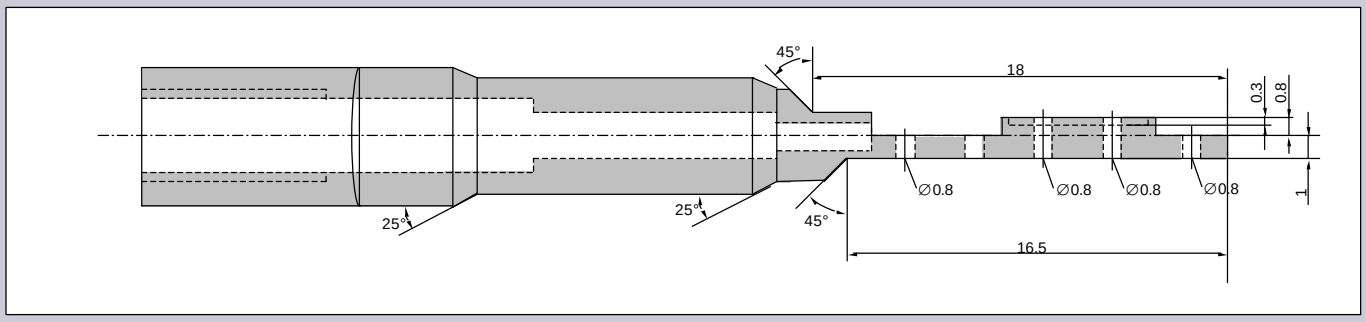
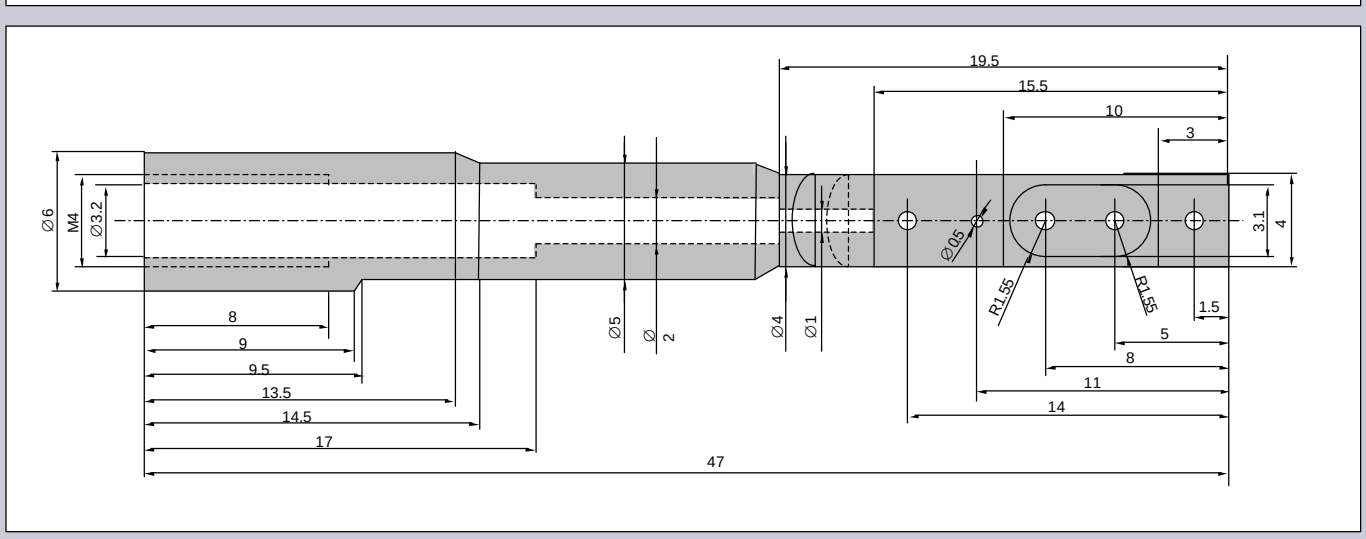


Fig. 3 Assembling the new construction: (1) A U-shaped electrode is glued in a supporting stand in the form of a rectangular block with two holes parallel to the axis of the holder. (2) The supporting stand is fastened with a screw to the holder head. The electrode is contacted in one point only with a silver paste at the crook of the 'U'. (3) The biprism is attached to the U-shaped electrode with a silver paste.

6. Technical drawing of the new biprism holder tip





7. Photographs of the new biprism holder

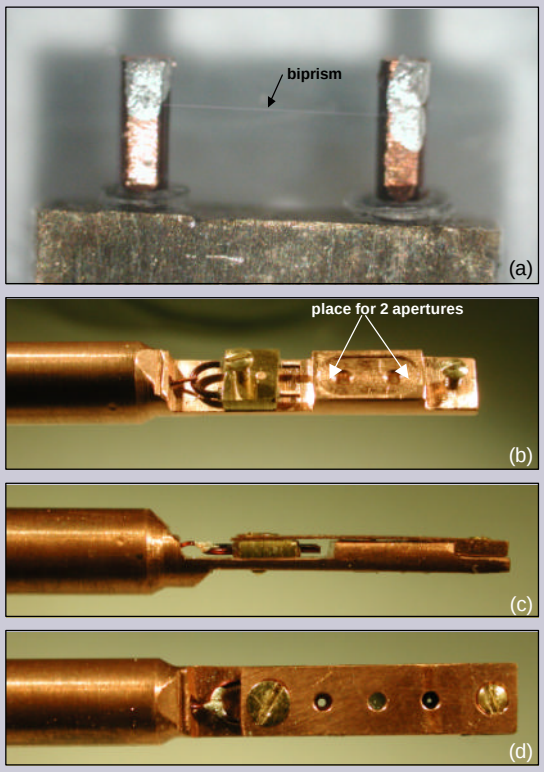


Fig. 4 (a) Biprism soldered on the U-shaped electrode. (b) Holder without the lid. (c) Side view and (d) top view of the holder with lid.

8. Acknowledgements

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9. References

[1] C. Hébert, P. Schattschneider, Ultramicroscopy 96 (2003) 463
[2] G. Möllenstedt, H. Düker, Zeitschr. für Physik 42 (1955) 41

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