VACUUM-SEALED ELECTRON BEAM MICROCOLUMN FOR HIGH VACUUM MEMS SEVICES

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ABSTRACT

Since 1980s there has been an observable trend for miniaturization of electron beam microcolumns for several applications [1, 2]. At Wroclaw University of Science and Technology we also started to develop our own technique for miniaturization of microcolumns for the MEMS scanning electron microscope [3] and the MEMS X-ray source [4]. In our solution, all parts of the microcolumn are fabricated from silicon and glass using MEMS technology processes. The materials can be bonded together with an anodic bonding process that ensures vacuum-level sealing of the device. The microcolumn for the X-ray source comprises an electron emitter, gate and focusing electrode, and silicon/metal target for the generation of X-rays (Fig. 1, left), microcolumn designed for use in the MEMS electron microscope includes also octupole scanning system, an electron signal detector and a thin silicon nitride membrane that encloses the system (Fig. 1, right). The common part of both microcolumns is the electron emitter, a crucial element for every electron beam system. For a few years we have been working on a suitable electron emitter with the group from OTH Regensburg [5]. Also, both microcolumns are connected to a miniature high vacuum pump that generates a vacuum within the microsystem (~10^{-5} mbar). During the workshop fabrication methods, as well as most interesting results concerning the mentioned high-vacuum MEMS devices will be presented and discussed.

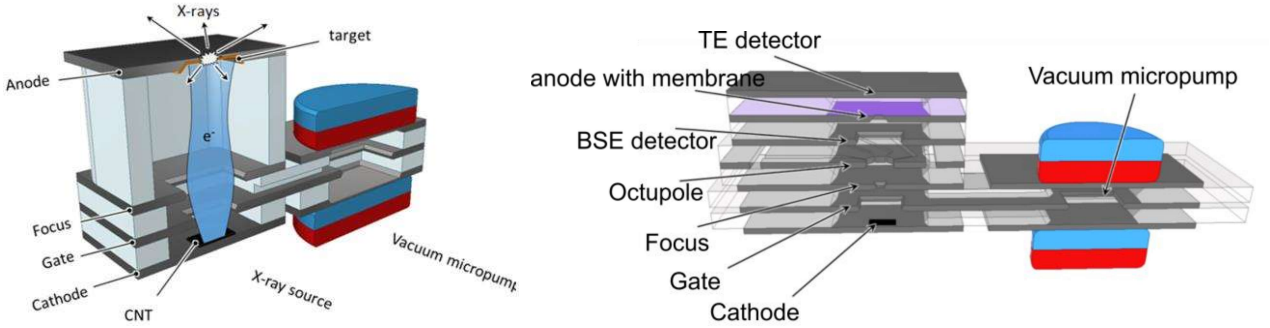

Fig. 1. Schematics of MEMS X-ray source (left) and MEMS electron microscope (right).

References

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