Contribution ID: **298** Type: **Poster**

Implanter applications of polyatomic ions from a high current liquid metal alloy ion source

Monday, 17 September 2018 17:45 (15 minutes)

High current liquid metal ion sources are versatile investigated and found their first application as field emission electric propulsion (FEEP) thrusters in space technology [1]. Due to the available ion current in the µA-range such kind of sources are also well suited for broad ion beam technology. LMAIS are also nearly the only type of ion sources delivering polyatomic ions from about half of the periodic table of elements [2]. Surface patterning based on self-organized nano-structures on e.g. semiconductor materials formed by heavy mono - or polyatomic ion irradiation from liquid metal alloy ion sources (LMAIS) is a very promising technique demonstrated using a focused ion beam (FIB) equipment [3]. To overcome the lack of only very small treated areas by applying a FIB working with such sources, the technology taken from space propulsion systems was transferred into a large single-end ion implanter. The main component is an ion beam injector containing the high current LMAIS combined with suited ion optics allocating a high current nearly parallel ion beam of a few mm in diameter. Different kinds of LMAIS (needle type, porous emitter, capillary type) are presented and characterized with respect to their performance. The ion beam injector design is specified as well as the implementation of this module into a commercial 200 kV high current ion implanter (Danfysik 1090) operating at the HZDR Ion Beam Center. Large area surface modification of Ge using polyatomic Bi2+ ions at room temperature emitted from a GaBi capillary LMAIS will be presented [4] and compared with the results of FIB technology.

[1] M. Tajmar and B. Jang, New materials and processes for field emission ion and electron Emitters, CEAS Space J. 4 (2013) 47.
[2] L. Bischoff, P. Mazarov, L. Bruchhaus, and J. Gierak, Liquid Metal Alloy Ion Sources - An Alternative for Focused Ion Beam Technology, Appl. Phys. Rev. 3 (2016) 021101.
[3] R. Böttger, L. Bischoff, K.-H. Heinig, W. Pilz, and B. Schmidt, From sponge to dot arrays on (100)Ge by increasing the energy of ion impacts, J. Vac. Sci. Technol. B 30 (2012) 06FF12.
[4] W. Pilz, P. Laufer, M. Tajmar, R. Böttger, and L. Bischoff, Polyatomic Ions from Liquid Metal Ion Source driven High Current Ion Implanter, Rev. Sci. Instrum. 88 (2017)123302.

Primary authors: Dr BISCHOFF, Lothar (Helmholtz-Zentrum Dresden-Rossendorf); Dr PILZ, Wolfgang (Helmholtz-Zentrum Dresden-Rossendorf); Mr LAUFER, Philipp (Technische Universität Dresden); Prof. TAJMAR, Martin (Technische Universität Dresden); Dr BÖTTGER, Roman (Helmholtz-Zentrum Dresden-Rossendorf)

Presenter: Dr BISCHOFF, Lothar (Helmholtz-Zentrum Dresden-Rossendorf)

Session Classification: Poster session 1

Track Classification: P1 Instrumentation and methods