

MEMS ion sources developed for chip-scale mass spectrometer

Piotr Szyszka*, Tomasz Grzebyk, Michał Krysztof, Marcin Białas, Anna Górecka-Drzazga,
Jan. A. Dziuban

*Faculty of Microsystem Electronics and Photonics, Wrocław
University of Science and Technology, Poland
e-mail: piotr.szyszka@pwr.edu.pl*

Mass spectrometry is one of the most powerful analytical techniques that allows identification and quantification of molecules based on their mass-to-charge ratio. There are many types of mass spectrometers which enables analysis of solid, liquid and gaseous samples (in the different pressure range). Therefore, each type of sample requires a different ionization method.

This paper will present the overview of the recently developed MEMS ionizers dedicated for a chip-scale mass spectrometer. Our works were focused on ionization of gaseous samples under different pressure conditions, which is why these tests will show what type of mass analyzer should be used for specific ionizers.

Two different ionization phenomena were considered: by electron-impact and by glow discharge; resulting in developing four types of ion sources that covers wide pressure range (Fig.1). Every ionizer structure was elaborated as a ready-to-integrate silicon-glass chip and was made using MEMS techniques.

Currently, the authors are working to apply the developed ionizer technology to produce a working MEMS mass spectrometer. All necessary mass spectrometer elements (sample injection system, ionizer, mass analyser with detector and vacuum micropump) will be integrated on the same chip, resulting in obtaining of self-sufficient, battery operated miniature device.

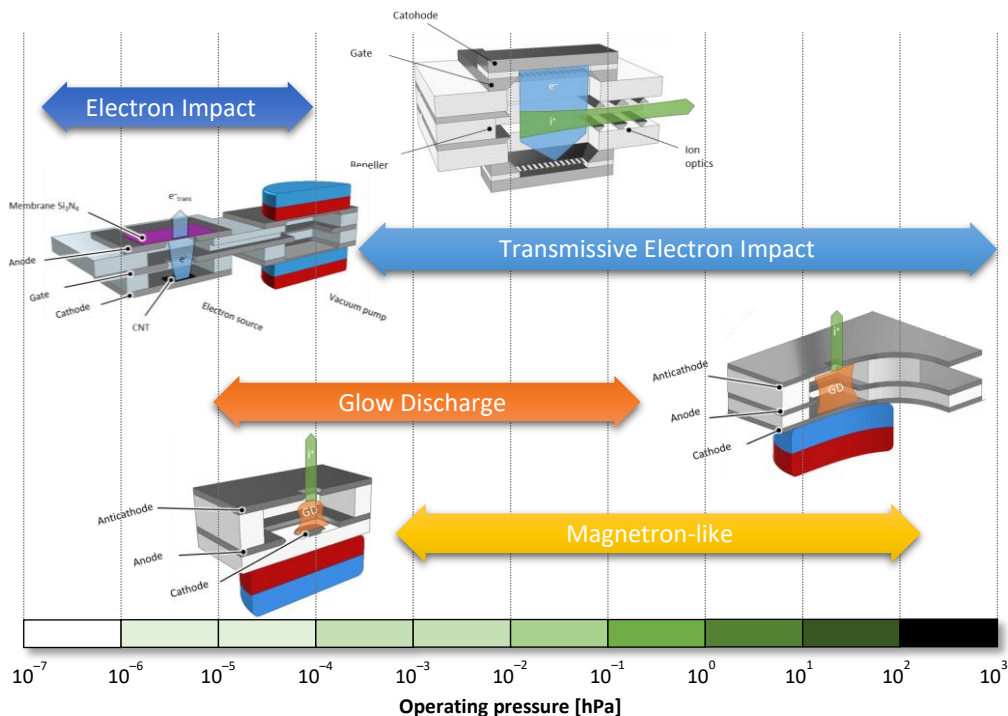


Fig 1. Comparison of operating pressures of various developed MEMS ion sources

The work was partially financed by the Statutory Grant of Wrocław University of Science and Technology, by the National Science Centre, Poland project no. 2016/21/B/ST7/02216 and by the National Centre for Research and Development, Poland project no. POL-SINIV/2/2018.