

**DESIGN OF AN ELECTRON IONISATION SOURCE FOR AN  
ORTHOGONAL ACCELERATION TIME OF FLIGHT MASS SPECTROMETER.**

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This research aims to develop an electron ionisation source optimised for an orthogonal acceleration time of flight mass spectrometer (oa-TOFMS). The inclusion, in the spectrometer that is concurrently being constructed, of an orthogonal accelerator with ion mirror (reflectron) assists in spatial and energy focusing of the instrument.<sup>1</sup> The proposed dimensions of the reflectron mass spectrometer are 0.7m x 0.4m x 0.1m (L x W x H respectively). The disadvantages of using continuous ion sources in the past, such as EI and CI, is that the ions formed at the point of ionisation acquire an initial spatial and velocity dispersion.<sup>2</sup> This promotes a spread in arrival times as isobaric ions of greater velocity will tend to pass ions of lower velocity, resulting in less resolved ion packets at the detector.<sup>3</sup> The ion source developed will produce a low energy ion beam, typically 10-30 eV with characteristics more suited to oa-TOF analysis, than for scanning and sector mass spectrometers. Greater sensitivity, resolution and duty factors are sought. The performance of the simulated ion source was evaluated by I-Opt<sup>4</sup> and SimTOF<sup>5</sup>, programs used to predict ion trajectories, energies, resolution and peak shapes afforded by the mass spectrometer. The programs indicate that the overall sensitivity of the instrument will be significantly better than current mass spectrometers available. Simulations of a sector ion source (manufactured by VG Analytical Ltd, Manchester, UK) via I-Opt<sup>4</sup> indicates that the new ion source will produce a sensitivity significantly greater in the TOF deployment. Conventional EI ion sources use magnets on either side of the ionisation region to collimate electrons in a helical motion, localising ionisation near the extraction region. Magnetic fields may however deflect the overall trajectories of low and moderate mass ions in the ion source. The use of a ferrous yoke in the new design was investigated with the use of a Gauss meter to determine whether the effects of magnetic fringing fields around the ion source may be minimised. The predicted resolution of the instrument will be in the range of 4500-6000 (FWHM) for organic compounds of relatively low mass, such as VOCs of MW<200. This paper will describe the methods and the results of the simulations of the EI oa-TOFMS instrument currently being constructed at UNSW.

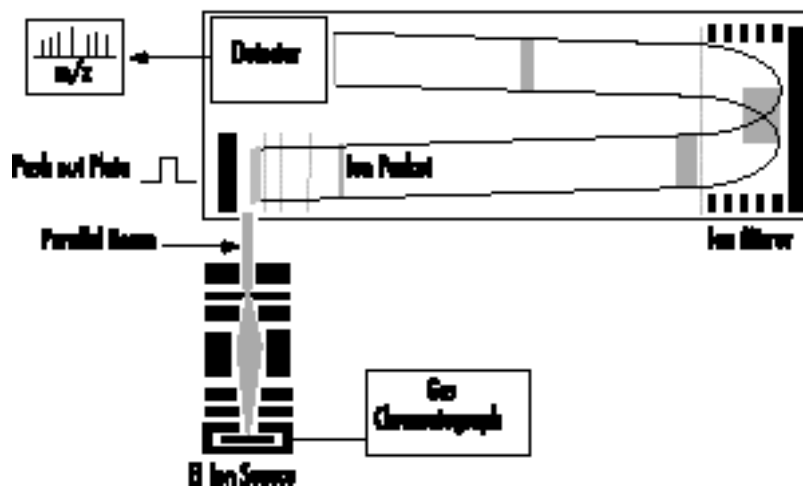


Figure 1

1. J.N. Coles and M. Guilhaus, *J Am Soc Mass Spectrom.* **1994**, *5*, 772-778
2. J.H.J. Dawson and M. Guilhaus, *Rapid Commun. Mass Spectrom.* **1989**, *3*, 155-159
3. M. Guilhaus, *J Am Soc Mass Spectrom.* **1994**, *5*, 588-595
4. I-Opt: Ion optics computer program, © J.H.J. Dawson and M. Guilhaus (1990).
5. SimTOF: Resolution and peak shape modeling program, © M. Guilhaus and V. Mlynski (1993).

A copy of this presentation is available at  
<http://www.chem.unsw.edu.au/research/AnalyticalMassSpec/>