PIMS Update

(Positive Ion Mass Spectrometry)

National Electrostatics Corp.
June, 2019

*This newsletter is meant to provide periodic updates to customers who have expressed interest in the PIMS system. Previous updates and other information can be found on the NEC website (*http://www.pelletron.com/products/positive-ion-mass-spectrometry-pims-systems/*)*

What has been happening in 2019?

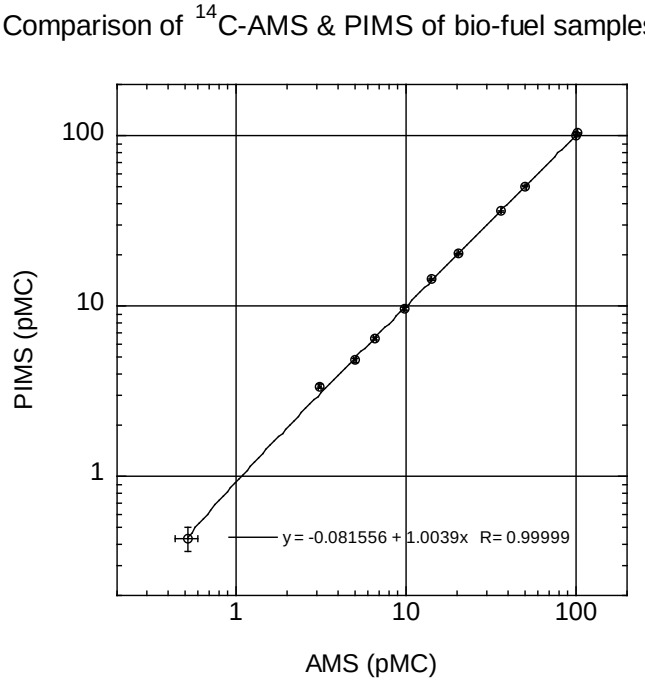
Since the previous update, NEC, SUERC, and Pantechnik have been busy characterizing the system and refining the existing design. We have been demonstrating the system to users in various industries, such as traditional radiocarbon, biofuel, and pharmaceuticals. The focus now has been devoted to sample interface automation. Most importantly, we are proud to release our **latest dataset**, in which we compare data from Traditional AMS and PIMS systems.

Comparison of ^{14}C AMS & PIMS of bio-fuels

The results table and graphs (below) are of bio-fuel samples measured at SUERC. PIMS was performed on the prototype positive-ion mass spectrometer manufactured by National Electrostatics Corp., whereas AMS was done on a traditional NEC accelerator mass spectrometer. Separate sample aliquots were prepared as CO_2 for PIMS and AMS, and then additionally converted to graphite for AMS. The ampules of gas were cracked on-line to the PIMS instrument and bellows were used to regulate the sample flow into the plasma positive-ion source. Sample radiocarbon activity is expressed in percent modern carbon (pMC). ^{14}C-PIMS and ^{14}C-AMS data are in excellent agreement. This data, and more, are to be presented at the IMOG 2019 meeting.

SUERC AMS Laboratory results for: Bio-fuels PIMS & AMS

Name	AMS (pMC)	PIMS (pMC)
Sample 1	102.94±0.30	103.42±0.54
Sample 2	100.11±0.32	100.43±0.62
Sample 3	50.76±0.15	50.56±0.35
Sample 4	36.11±0.14	36.05±0.22
Sample 5	20.31±0.10	20.27±0.22
Sample 6	14.06±0.09	14.33±0.19
Sample 7	9.81±0.09	9.72±0.17
Sample 8	6.59±0.08	6.40±0.12
Sample 9	5.01±0.08	4.81±0.12
Sample 10	3.11±0.08	3.37±0.10
Sample 11	0.52±0.08	0.43±0.07
Background	0.13±0.04	0.14±0.02



Other PIMS related improvements have centered around the following:

- The PIMS prototype instrument makes ~200 nA $^{13}C^-$ at the final Faraday cup. This is equivalent to a traditional accelerator mass spectrometer injecting 45-60 uA of $^{12}C^-$ from a gas-capable sputter ion source, which is currently beyond the capabilities of AMS. PIMS combines the convenience and automation of fluid-sample measurement with the productivity and analysis precision of traditional solid-sample AMS for best overall performance.
- The PIMS instrument design is being improved for even higher beam currents and simplified for an even smaller footprint.
- We are developing a new Ampule Handling System for high-sample-throughput that will be available later in 2019. In order to learn more about how customers use glassware, NEC is currently conducting market research to determine the optimal configuration of a new ampule handling system for radiocarbon measurements.

  If you are interested in providing your input to help us determine the optimal configuration for this system, please visit: https://www.pelletron.com/co2-ampule-survey/

  All responses will be carefully considered by NEC and the information provided will be kept strictly confidential.

That's all for this month, but please email or call us with any questions you may have about the system. Stay tuned for future updates and more data soon!

Michael Mores and the NEC Sales Team
sales@pelletron.com