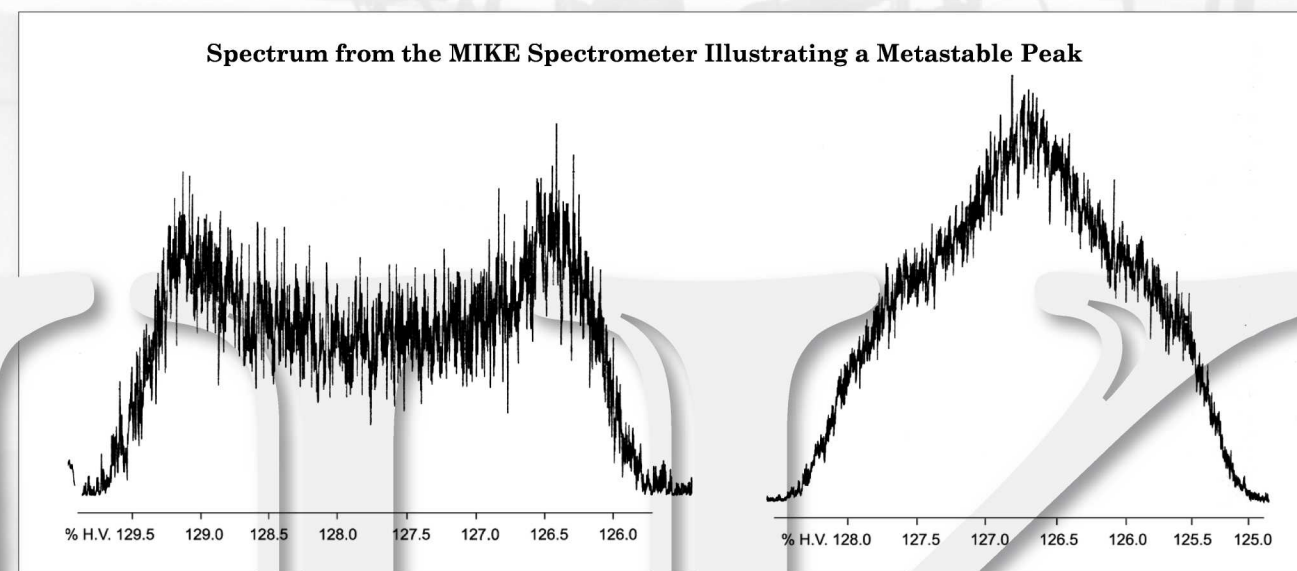
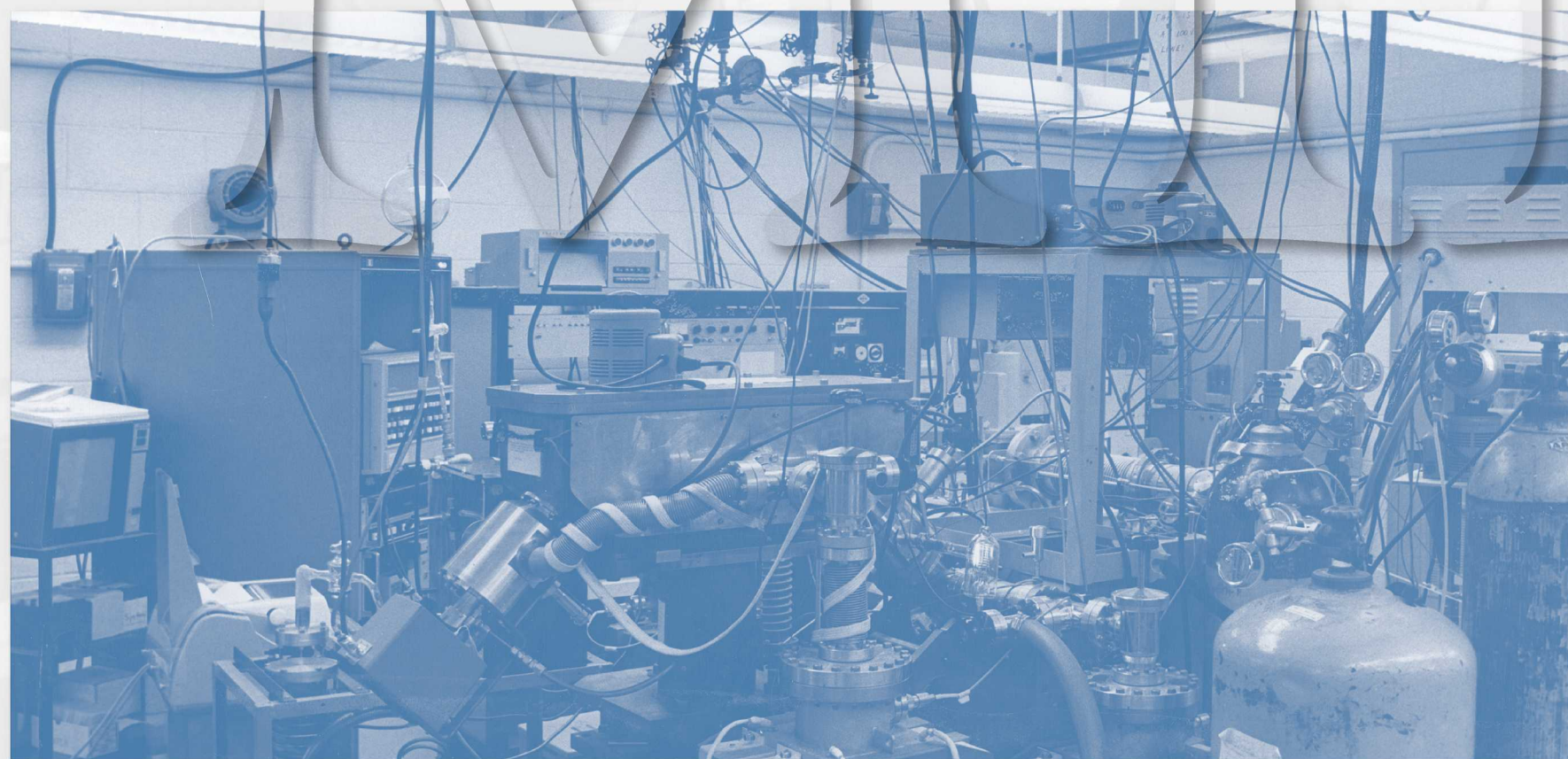


The mass-analyzed ion kinetic energy spectrometry (MIKES) instrument was designed and constructed at Purdue University in the period 1971-1973 by J. H. Beynon, J. W. Amy, R. G. Cooks, W. E. Baitinger, and T. Y. Ridley. It was built to allow the characterization of ions by their metastable and collision-induced dissociation processes. It combined the utility of its predecessor, the ion kinetic energy spectrometer, with the ability to mass-select precursor ions. The precursor ion is mass-selected using the magnetic sector and its dissociation products are mass analyzed using the electric sector (a kinetic energy/charge analyzer, but a mass/charge analyzer at constant ion velocity). The details of the peak shapes revealed in the electric sector scan provide information on the kinetic energy release in the course of fragmentation and on the kinetic energy uptake in the course of ionic collision processes. Dispersion of velocities due to kinetic energy release leads to the characteristic wide metastable peaks observed using the MIKES technique.



Composite metastable peaks for the loss of NO. from the para-substituted nitrobenzenes p-NH<sub>2</sub> (left) and p-F (right). (Reprinted from Beynon, J. H.; Bertrand, M.; Cooks, R. G. "The Metastable Loss of NO. from Aromatic Nitro Compounds" *J. Am. Chem. Soc.* 1973, 95, 1739-1745.)



The MIKE spectrometer is a reverse-geometry (BE) mass spectrometer and was the first tandem mass spectrometer used for analysis of mixtures. This application was launched with the addition of a chemical ionization source to the instrument, allowing mixtures of compounds to be converted to the corresponding mixtures of molecular ions. The experiment, which came to be known as tandem mass spectrometry (MS/MS), showed improved signal-to-noise ratios through the elimination of chemical noise when used for the analysis of trace components in complex mixtures. Subsequent instrumental developments, seeking to overcome the limitations of the MIKE spectrometer, led to the development of other tandem mass spectrometers such as the triple quadrupole, the quadrupole/time-of-flight (Q/TOF) and other hybrid instruments, such as the BQQ and BEQQ which mixed sectors with quadrupole mass filters.

Photograph of the MIKE spectrometer at Purdue University, ca 1981

Title page of the first journal article describing the design and performance of the MIKE spectrometer which first appeared in the A-pages of *Analytical Chemistry* in October of 1973. The original signatures are from those people who worked on the MIKES during its active period and returned to Purdue University in 1994 for its decommissioning.

