

Yale's open facility on ion mobility spectrometry/mass spectrometry (IMS-MS)

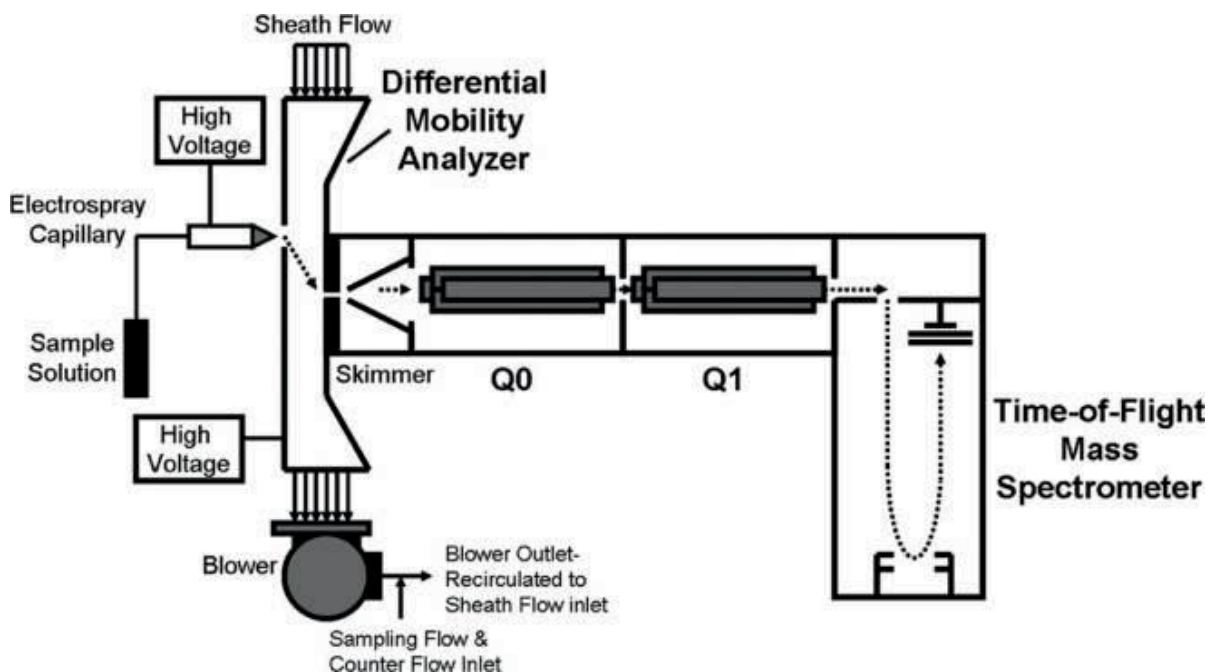
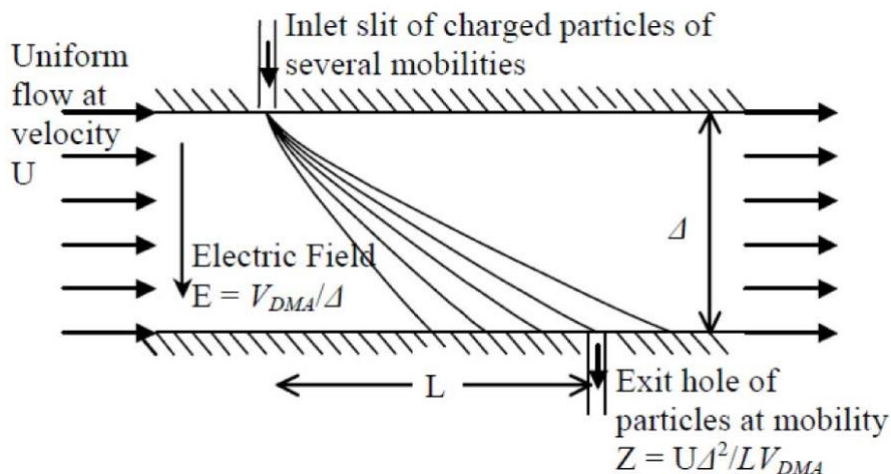
For mass resolved structural studies in the gas phase

PI: Juan Fernandez de la Mora (Mechanical Engineering)

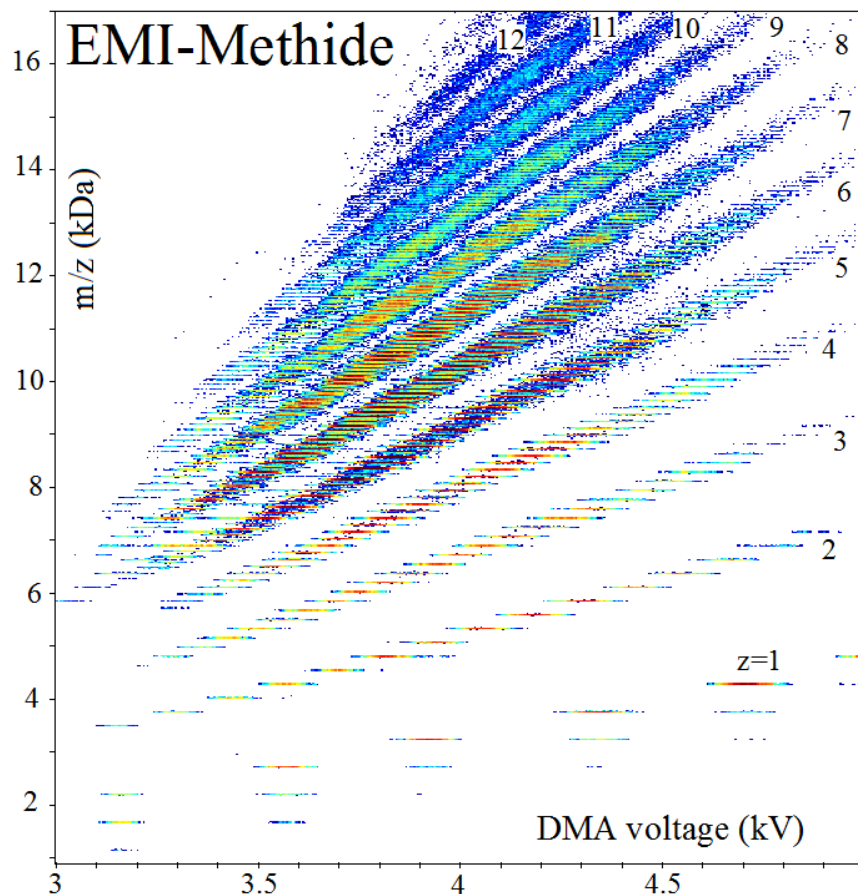
Gift from companies Sciex and SEADM: Located at the Keck Foundation (School of Medicine)

<https://www.eng.yale.edu/DMAMSfacility/index.html#open>

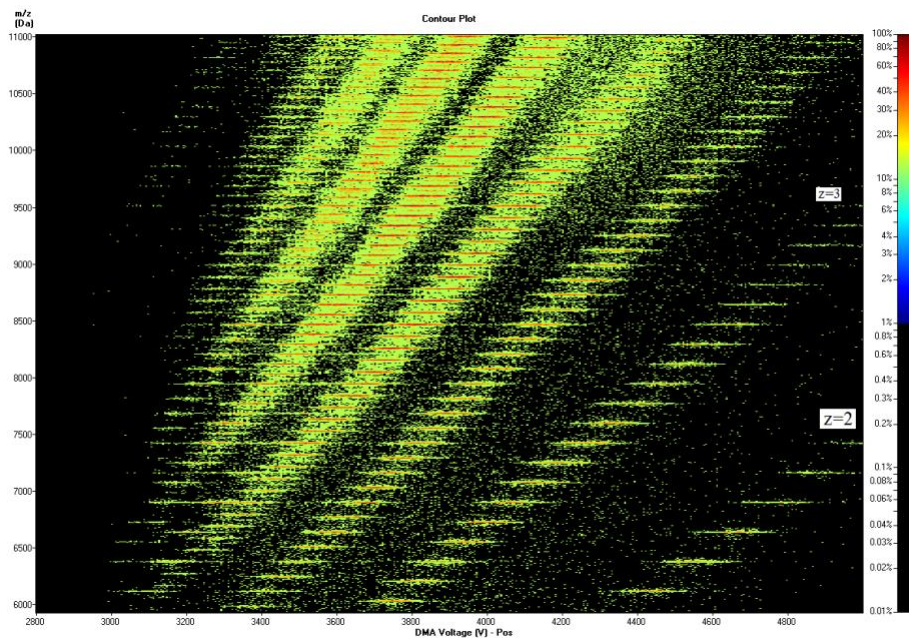
The differential mobility analyzer (DMA) operates at atmospheric pressure

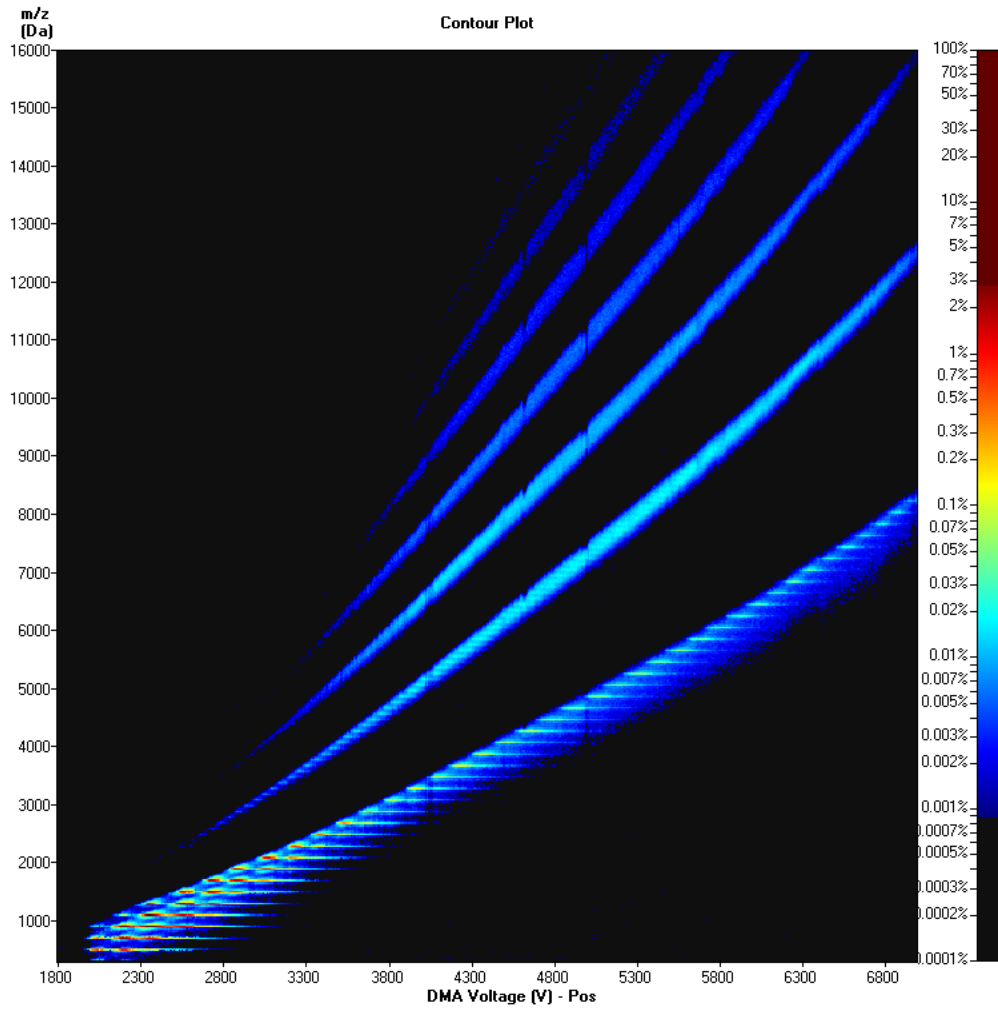


Nanodrops of ionic liquids

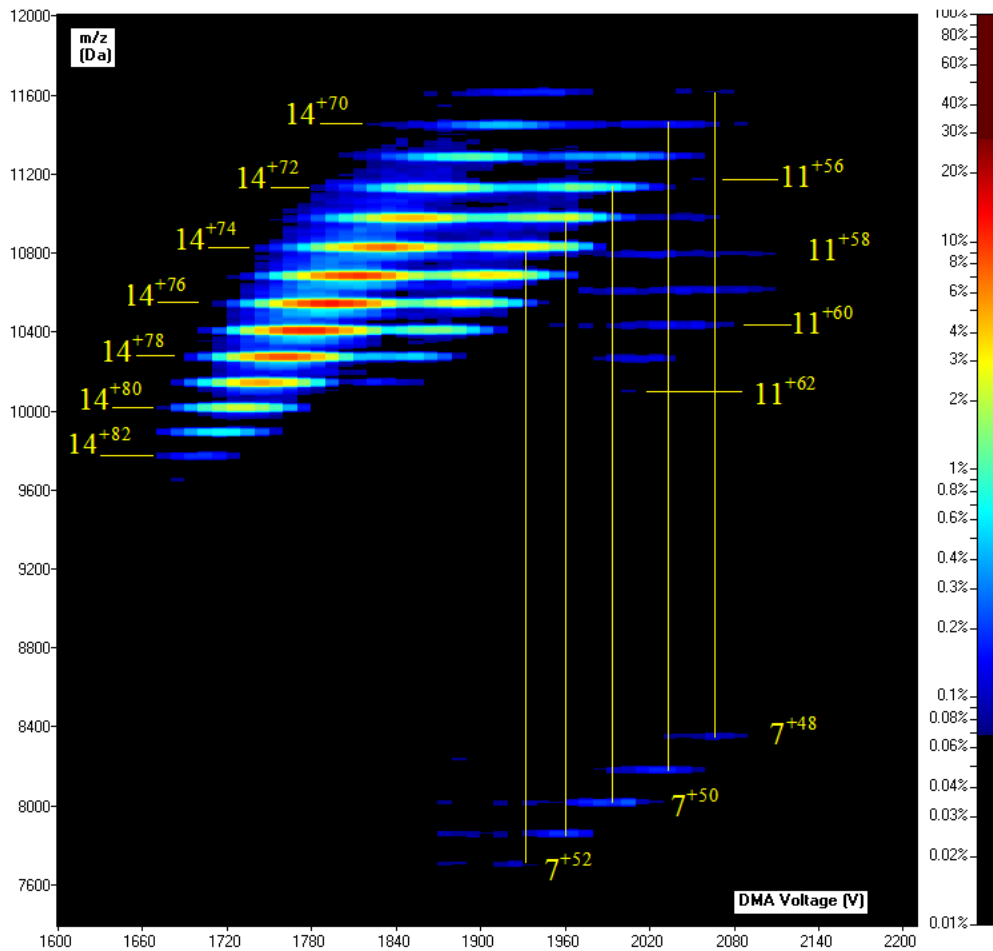
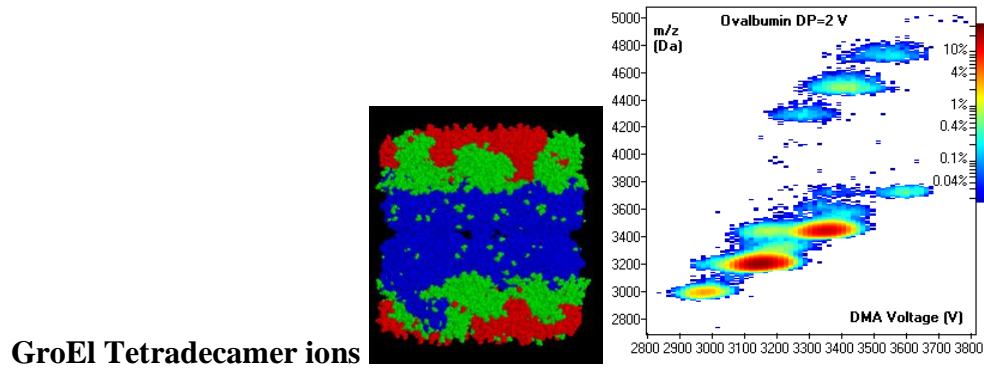


DMA-MS spectrum for electro sprayed nanodrops of the ionic liquid EMI-Methide. Each short horizontal segments is a *peak* for a pure species (n anions and $n+z$ cations). The color scale represents particle abundance. The peaks group into broad bands with fixed charge states z (indicated), yielding mobility versus m and z , and size distributions for the various charge states. The groups of vertically displaced lines for $z=1$ nanodrops are due to single neutral molecule evaporation events following the DMA, greatly enhanced by the Kelvin effect (adapted from Hogan and Fernandez de la Mora, Phys. Chem. Chem. Phys., 2009, 11, 8079-8090).



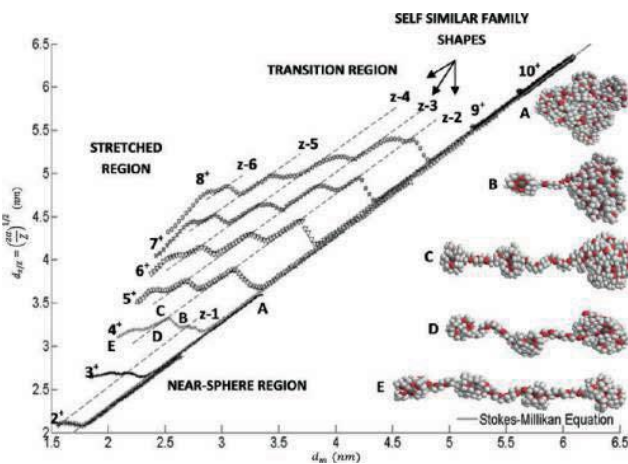
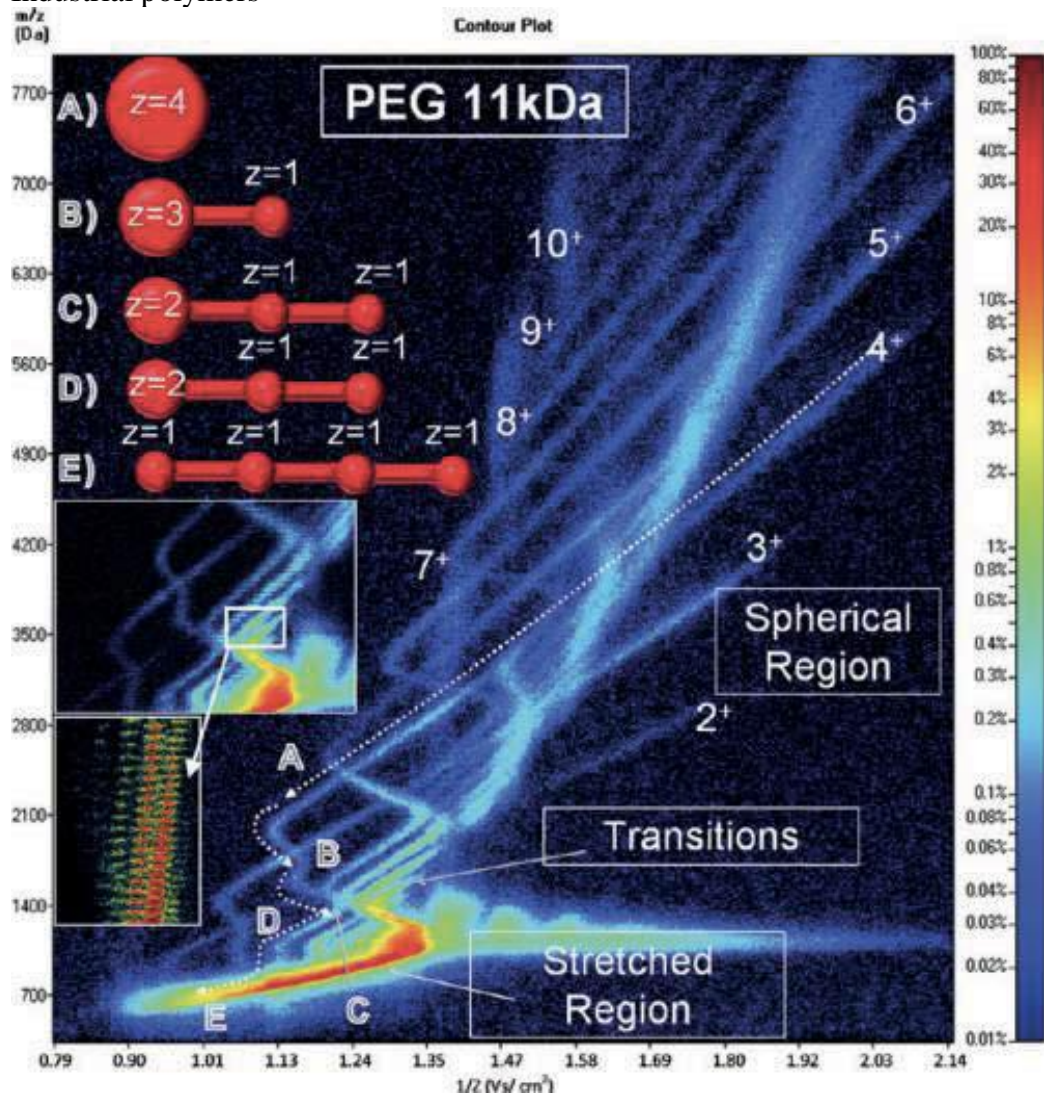


Proteins and protein complexes



Hogan, C.; Ruotolo, B.; Robinson, C.; Fernandez de la Mora, J.. Tandem Differential Mobility Analysis-Mass Spectrometry Reveals Partial Gas-Phase Collapse of the GroEL Complex, *J. Phys. Chem. B*, 115(13), 3614-3621, 2011

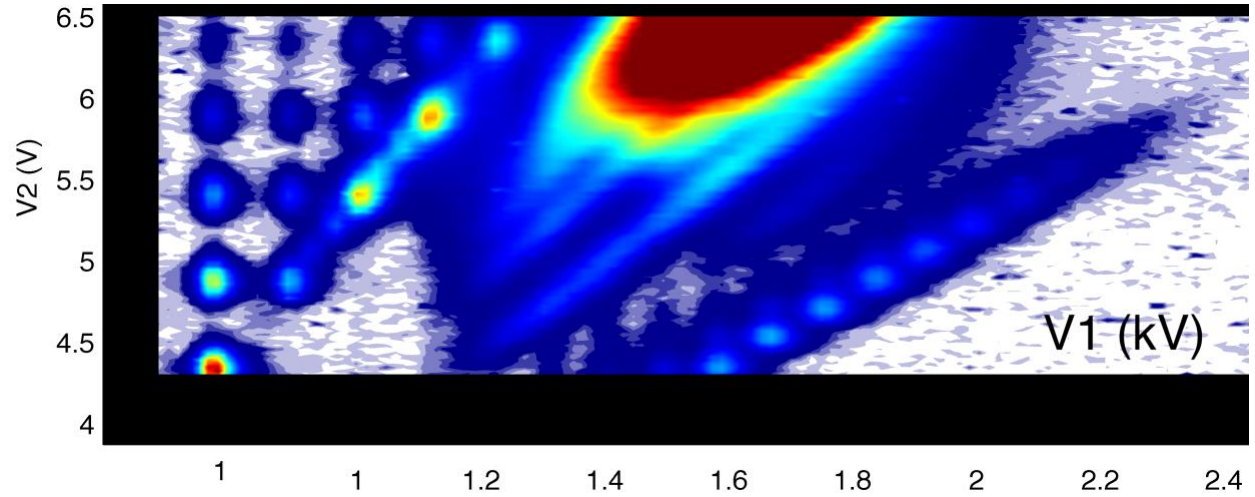
Industrial polymers



C. Larriba-Andaluz and J. Fernandez de la Mora, Gas Phase Structure of Coulombically Stretched Polyethylene Glycol Ions., *J. Phys. Chem. B*, 116, 593-598, 2012

TANDEM DMA STUDIES

Placing two DMAs in tandem (i.e. substitute the mass spectrometer by a DMA and perform the tandem analysis fully at atmospheric pressure



Investigation on the evaporation of cluster ions from ionic liquids

FINAL SLIDE

What can you offer to the Yale instrumentation community.

The instrument is operational at the Keck Foundation at the Yale School of medicine.

The facility is open for anyone to use as long as we can keep it running. It has produced 16 publications, most involving visitors

Critical needs:

The DMA-MS facility has not been used for over 1 year, due to lack of external funding. It would be nice to get it back into a productive mode to secure the space it is using at Keck

How could the Yale instrumentation initiative help

By creating a more positive mentality regarding collaborations with industrial partners, including companies related to the faculty.

A way to start would be to reduce the number of internal Yale obstacles in the path to these collaborations

The dialogue between individual Yale instrument developers and the administration would be greatly facilitated if there was an administration appointed faculty/researcher through whom the many problems faced by Yale instrument developers could be heard and addressed with agility.