ION CYCLOTRON RESONANCE OF METAL CLUSTERS

Another major push during this past year has been in the development of our ICR experiments with metal cluster ions. Throughout the year this has been almost solely the responsibility of a few Rice physics undergraduate majors who have done a superb job. Last month this work broke through to the observation of our first strong FTICR signals from a metal cluster injected from the supersonic beam. A figure showing the FTICR spectrum of Nb_3^+ is attached showing a mass resolution of over 50,000.

The most important aspect of this result is that it is a proof of principal. It was done before our development of the cold cluster ion beam source, and at several orders of magnitude less cluster density than we expect to achieve within the next year. Nevertheless, it did show that our injection procedure into the ICR cell from the skimmed cluster beam was basically sound. We are still in the process of measuring the beam injection efficiency directly, but our initial results indicate that at least 10% of the cluster ions produced in the supersonic beam are being successfully trapped in the ICR cell and produce coherent ICR transients.

This injection procedure involves pulsing the cluster ions out of the supersonic beam at a right angle, collimating with an initial einzel lens, mass-selecting with a pulsed mass gate, focussing into the superconducting magnet with a second einzel lens, pulsed decelleration in two steps down to a few eV translational energy, and final trapping in the ICR cell. It sounds complicated -- and it is. But once set up with full