A CONTINUOUS SUPERSONIC EXPANSION DISCHARGE NOZZLE FOR ROTATIONALLY COLD IONS

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Molecular ions play an important role in chemistry and astronomy. In particular, molecular ions are key reaction intermediates, and in the interstellar medium, where temperatures and densities are low, they dominate the chemistry. Studying these ions spectroscopically in the laboratory poses a difficult challenge due to their reactivity. In our effort to study molecular ions, our research group is building SCRIBES (Sensitive Cooled Resolved Ion BEam Spectroscopy), which combines a cold ion source, mass spectrometry, and cavity ring-down spectroscopy. With this apparatus, we will be able to record rotationally-resolved gas-phase spectra, enabling interstellar searches for these species. The SCRIBES instrument requires a source of rotationally cold ions, and this has been accomplished by coupling a supersonic expansion with an electric discharge. Other groups (e.g. Thaddeus and McCarthy at Harvard, Salama *et. al* at NASA-Ames) have produced cold ions in a similar fashion, but always with a pulsed discharge source. Due to our need for a continuous ion source for SCRIBES, we have designed a continuous supersonic expansion discharge nozzle. We will discuss the various design factors considered during the construction of our continuous self-aligning cold ion source.