INFRARED PHOTODISSOCIATION SPECTROSCOPY OF SINGLY CHARGED TRANSITION METAL NITROGEN CLUSTERS

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Metal cation-nitrogen clusters, $M^+(N_2)_n$, of the first row transition metals are produced in a laser vaporization pulsed nozzle cluster source, size selected and excited in the infrared with an infrared OPO/OPA. Infrared photodissociation occurs by elimination of whole N_2 molecules and the photofragement yield versus wavelength produces IR resonance-enhanced photodissociation (REPD) spectra for the clusters. Vibrational bands seen in the 2100 to 2400 cm^{-1} region correspond to the N-N stretch but are shifted from those of free N_2. Density functional theory calculations on the bond enegeries, geometries and frequency shifts for first row M^+ (N_2) are also discussed in regard to periodic trends.