INFRARED PHOTODISSOCIATION SPECTROSCOPY OF VANADIUM-CARBON DIOXIDE CATIONS: EVIDENCE FOR AN INTRACLUSTER REACTION.

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Cationic vanadium-carbon dioxide clusters, consisting of up to ten carbon dioxide ligands, are produced in a molecular beam via laser vaporization in a pulsed nozzle source. The cations are mass selected and studied via infrared photodissociation spectroscopy in the 600-4000 cm^{1} region. The number of infrared active bands, their frequency positions and their relative intensities, allows us to gain insight into the structure and bonding of these species. The sudden appearance of new infrared bands in the spectra of complexes having seven or more ligands provides evidence for an intracluster reaction. We explore possible reaction products by comparing these spectra to those of vanadium and vanadium oxide-carbonyls. Low frequency measurements and DFT calculations have allowed us to identify complexes containing a metal atom bonded to an oxalate-like structure as the product of these reactions.