CRYOGENIC ION VIBRATIONAL SPECTROSCOPY OF PT(II)-METHANE CH ACTIVATION INTERMEDIATES

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Despite the rather simple composition of alkanes the strength of their C-C and C-H bonds has made controlled, selective reaction of these compounds an unrealized goal of synthetic chemistry. The field was pioneered by Shilov and coworkers in 1969 when they observed the exchange of H and D in methane that was bubbled into an acidic solution of K_2PtCl_4. The Shilov reaction has since been extended to induce oxidation of methane selectively to methanol and has become the standard bearer of CH activation despite its limitations. The mechanism for the reaction, while inferred from kinetics studies, is still largely uncharacterized. Here, we present our work towards applying cryogenic ion vibrational spectroscopy (CIVS) to capture the intermediate species of this reaction with a focus on the σ-CH adduct formed between methane and Pt(II) complexes that is believed to be crucial to the selectivity and rate of this reaction.