STRUCTURES AND SPIN STATES OF TRANSITION METAL CATION COMPLEXES WITH AROMATIC LIGANDS FROM FREE ELECTRON LASER IRMPD SPECTRA

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The infrared spectra of several transition metal cation complexes from about 5.5 to 16 microns were probed through multiple photon dissociation using the tunable free electron laser light source FELIX at the FOM Institute. For chromium cations, the mono complexes with aniline and anisole were shown to have the metal bound to the aromatic rings in a high-spin (sextet) state. The bis complexes of these ligands were also ring bound, but were low spin, probably doublet states. The chromium cation bis complex with acetophenone was shown to have the ligands bound at the carbonyl oxygen sites in a high-spin state. Nickel cation bis complexes with acetophenone were similarly found to be carbonyl bound, but cobalt cations, in addition to binding at the carbonyl sites of the acetophenone ligands, were also found to induce rearrangement to complexes having more varied binding patterns, apparently involving decarbonylation of a ligand, sometimes leading to loss of the CO from the complex.