MOLECULAR BEAM SPECTROSCOPIC STUDIES OF TRANSITION METAL CONTAINING RADICALS

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This oration will focus on four subjects: a) the experimental approaches utilized in the studies of molecular beam samples of metal containing radicals, b) the comparison of the permanent electric dipole moments, $\mu$, of early transition metal diatomic molecules, c) optical spectroscopy of transition metal dicarbides, and d) new directions using absorption based spectroscopy.

The experimental database of $\mu$ values for early 3$d$ and 4$d$ transition metal sulfides, oxides and nitrides is now extensive enough to examine ligand-induced trends in the ionic nature of bonding$^3$. The validity of a simple, single configuration molecular orbital correlation diagram will be described. The third topic is a report on the analysis of the high resolution optical spectrum of YCC, being performed in collaboration with Prof. A.J. Merer(U.B.C.), and the preliminary analysis of a low resolution optical study of what we believe to be PtCC. Yttrium dicarbide is the only gas-phase metal dicarbide to be detected via an optical spectroscopic technique$^4$. The correlation of the determined physical properties to their proposed role as catalytic agents in the formation of single walled nanotubes$^5$ will also be presented. Absorption based transient frequency modulation (FM) spectroscopy$^4, 5$ will be proposed as a new direction for the study of metal containing molecules in light of our recent comparison of this technique with LIF for TiS and PtC$^6$.