OPTICAL ZEEMAN STUDIES IN MOLECULAR BEAMS: IrN AND MoN

T C. STEIMLE and A. J. MARR, *Dept. of Chemistry and Biochemistry, Arizona State University, Tempe, AZ 85287-1604*; S. A. BEATON and J. M. BROWN, *The Physical and Theoretical Chemistry Laboratory, South Parks Road, Oxford, UK*.

Considerable insight into the nature of transion metal-ligand bonding has been gained from the interpretation of permanent electric dipole moments derived from molecular beam optical Stark measurments. However, few analogous Zeeman studies have been reported. Such studies enable the determination of ground and excited state magnetic dipole moments and thus g_J-factors. Previous Zeeman measurements on NiH[a] provide excellent illustrations of how experimentally determined magnetic g_J-factors can be used to decompose the observed electronic state into the appropriate linear combination of states described by the $^{2S+1}\Lambda$ term symbols. In these initial studies, the Zeeman effect on the F′=1/2←F′′= 3/2 hyperfine component of the R(0) line in the (0,0) band of the $A^1\Pi$- $X^1\Sigma$ transition of IrN, and the $P_{ff}(2.5)$ line of the (0,0) band of the $A^4\Pi$- $X^4\Sigma^-$ transition of MoN were investigated using a supersonic molecular beam optical spectrometer. The magnetic g_J-factor for IrN ($A^1\Pi$) was determined to be 0.96 ± 0.05. The g_J-factor, in conjunction with previously determined hyperfine paramaters [b], is used to predict a molecular orbital description for IrN. The Zeeman spectra for MoN are being reduced to produce values for the magnetic g_J-factors. The general applicability of moleular beam optical Zeeman measurements will be described.

[a] J.A. Gray, M. Li and R.W.Field, J. Chem. Phys. 92, 4651 (1990)
[b] T.C. Steimle, K.Y. Jung and B.-Z. Li, J. Chem. Phys. 103, 1767 (1990)