# INFRARED PHOTOCHEMICAL STUDIES OF $W(CO)_6$ IN CRYOGENIC SOLID PARAHYDROGEN

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We report our results and analysis of the 355 nm photodissociation of $W(CO)_6$ in cryogenic solid parahydrogen ($pH_2$) which is followed via high resolution infrared absorption spectroscopy. The photochemistry of $W(CO)_6$ has been extensively studied in low temperature glasses and matrices, in the liquid phase, and in the gas phase. In the current studies the $W(CO)_6$ doped $pH_2$ crystal is exposed to the 355 nm output of a 10 Hz Nd:YAG laser for short periods of time. Two photoproducts have been identified. In one case a single CO ligand is eliminated and replaced with a $H_2$ molecule resulting in a non-classical molecular hydrogen compound $W(CO)_5(H_2)$ with absorptions at approximately 1950, 1980 and 2103 $cm^{-1}$, which are attributed to $A_1$, E, $A_1$ carbonyl stretching vibrations[a] of the $C_4v$ photoproduct. The other photoproduct is identified as $cis$-$W(CO)_4(H_2)_2$ with carbonyl stretching vibrations at 1944 and 2076 $cm^{-1}$, attributed to the $a_1$ and $b_2$ modes of the $C_2v$ fragment.[b] In addition, infrared absorptions of the photodissociated CO are also observed, and the CO spectrum shows that the CO is undergoing hindered rotation. Further analysis of the photochemical mechanism is underway and will be presented.

[a] L. E. Orgel, Inorg. Chem. 1, 25 (1962).
[b] S. E. J. Goff, T. F. Nolan, M. W. George, and M. Poliakoff, Organometallics 17, 2730 (1998).