

## REACTION OF GAS PHASE Fe ATOMS WITH O<sub>2</sub> AND N<sub>2</sub>O

Ja Kang Ku and Kun-tack Lee

Department of Chemistry, Pohang University of Science and Technology,  
Pohang, 790-784

Reaction of gas phase Fe atoms with O<sub>2</sub> and N<sub>2</sub>O have been investigated. The gas phase Fe atoms were generated by multiphoton dissociation of Fe(CO)<sub>5</sub> using an unfocused UV laser beam and the formation of FeO molecules as a reaction product was identified by a laser-induced fluorescence method. It has been found that the laser-induced fluorescence signal from FeO molecules is stronger in O<sub>2</sub> than in N<sub>2</sub>O implying that O<sub>2</sub> is more reactive even though the bond energy of O<sub>2</sub> is much larger than that of N<sub>2</sub>O. The radiative lifetime for the 591.1 nm band of the FeO Orange system was found to be  $260 \pm 20$  ns, and the quenching rate constants for this band were  $4.3 \pm 0.3 \times 10^{-10}$  in O<sub>2</sub> and  $5.4 \pm 0.2 \times 10^{-10}$  cm<sup>3</sup>molecule<sup>-1</sup>s<sup>-1</sup> in N<sub>2</sub>O. It is also found that the ground state FeO molecules are quite reactive with O<sub>2</sub> and N<sub>2</sub>O, and the depletion rate constants for the ground state FeO were  $1.7 \pm 0.2 \times 10^{-12}$  in O<sub>2</sub> and  $5.6 \pm 0.2 \times 10^{-12}$  cm<sup>3</sup>molecule<sup>-1</sup>s<sup>-1</sup> in N<sub>2</sub>O, respectively. The depletion behavior of the ground state FeO was found to be different from that of the ground state Fe(a<sup>5</sup>D) atoms suggesting that the FeO molecules are generated from the excited state Fe atoms.