

## CHEMICAL MODELING OF O<sub>2</sub> IN INTERSTELLAR CLOUDS

DONGHUI QUAN, *Chemical Physics Program, The Ohio State University, Columbus, OH 43210*; ERIC HERBST, *Departments of Physics, Astronomy, & Chemistry, The Ohio State University, Columbus, OH 43210*; GEORGE E. HASSEL, *Department of Physics, The Ohio State University, Columbus, OH 43210*.

In cold cores of interstellar clouds, molecular oxygen cannot be detected at all down to rather low upper limits. This has been a problem for chemistry modelers since steady-state results of their models always give high O<sub>2</sub> abundances. In chemical models, the reaction between O and OH is the main source of O<sub>2</sub> formation. Experimental studies have shown that the rate coefficient of this reaction down to 39 K is  $3.5 \times 10^{-11} \text{ cm}^3 \text{ s}^{-1}$ , which is almost one order of magnitude lower than values used by modelers. Two recent quantum calculations with an accurate HO<sub>2</sub> potential surface have suggested that at 10 K, this rate coefficient is even much smaller. This small rate coefficient might inhibit the production of O<sub>2</sub> and explain the negative results for O<sub>2</sub> towards cold interstellar clouds. In this work, we show how the interstellar O<sub>2</sub> abundance is affected when the rate coefficient is decreased. Under standard O-rich elemental abundances, the calculated O<sub>2</sub> abundance is sufficiently low to lie below the observed upper limit only at early times with all the rate coefficient values we investigated. Under C-rich abundances, both early-time and late-time solutions are possible.