GAS-GRAIN MODELING OF $O_2$ IN INTERSTELLAR CLOUDS

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The lack of detection of interstellar gas phase $O_2$ in cold dense interstellar clouds has been a problem to modelers of the chemistry of these regions. This non-detection disagrees with steady-state models which predict overly high concentrations compared with observed upper limits of this molecule obtained with SWAS and Odin observatories. Recently, gas phase $O_2$ was detected in an unusual region in Orion by the Herschel Space Observatory. In this work, we continue the study of Quan et al. 2008. Apart from the gas phase chemistry discussed in detail in Quan et al. 2008, the role of dust grains in interstellar chemistry is included. Here we present the results from a series of gas-grain models in which physical conditions were varied to simulate several interstellar hot and cold regions. The role of the dust grains can explain the low abundances of gaseous $O_2$ in the cold regions, and the possible places where this molecule may have observable abundances are suggested.