A POSSIBLE MECHANISM FOR SULFUR MASS INDEPENDENT FRACTIONATION IN THE B-X SYSTEM OF $S_2$

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Here, I continue my discussion of Sulfur Mass Independent Fractionation (S-MIF) in the $S_2$ B-X UV band system, relevant to the geologic signature of the anoxic atmosphere that existed prior to the Great Oxygen Event 2.4 billion years ago. To test a possible mechanism for the isotope effect, I implement a steady state, master equation kinetic model for every bound rovibronic state in the B/B" system. This model incorporates both rotationally inelastic and electronically inelastic collisions. The output of the model suggests that such collisions have negligible impact on average excited state lifetimes, indicating that the isotope effect is primarily spectroscopic in nature. The steady state populations that are output from the deperturbation/master equation model are useful in identifying which bright/dark state crossings are most proficient at populating long lifetime states, and thereby generating an S-MIF signature. A major conclusion from this analysis is that only a small minority of level crossings have such a capability, and, consequently, these have a dominant influence on the isotope effect averaged over the total system.