OVERTONE VIBRATIONAL SPECTROSCOPY AND DYNAMICS IN H_2-H_2O COMPLEXES: A COMBINED THEORETICAL AND EXPERIMENTAL STUDY

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H_2 is the most abundant molecule in the universe and also H_2O occurs in relatively high concentrations in various interstellar environments. Processes that occur through the interaction of these molecules may, for example, play a role in the mechanism producing the observed H_2O maser activity. Spectroscopic studies of the H_2-H_2O complex in different stable and metastable states will be reported in the accompanying talk; theoretical studies will be presented here. The latter involve calculations of the bound rovibrational levels of the complex with both monomers in their vibrational ground state, as well as of the metastable levels with H_2O in its OH stretch overtone state, on the appropriate *ab initio* five-dimensional intermolecular potential surfaces. Also the line strengths of all the allowed transitions between these levels that may occur in combination with the $v_{\mathrm{OH}} = 2 \leftarrow 0$ overtone transition were computed, for all four ortho/para H_2 and ortho/para H_2O variants of the complex. The spectrum simulated with these data agrees very well with the measured spectrum and was used to assign this spectrum. In addition, the information obtained from the theory was useful to understand the observed predissociation dynamics of the complex.