

# High excitation rovibrational molecular analysis in warm environments

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We investigate rovibrational emission CO and SiO in warm astrophysical environments. With recent innovation in collisional rate coefficients and rescaling methods, we are able to construct more comprehensive collisional data with high rovibrational states (vibration up to  $v=5$  and rotation up to  $J=40$ ) and multiple colliders ( $H_2$ , H and He). These comprehensive data sets are used in spectral simulations. We obtained line ratio diagnostic plots and line spectra for both near- and far-infrared emission lines over a broad range of density and temperature for the case of a uniform medium. Considering the importance of both molecules in probing conditions and activities of UV-irradiated interstellargas, we model rovibrational emission in photodissociation region (PDR) and AGB star envelopes (such as VY Canis Majoris) with Cloudy. Rotational diagrams and spectra are produced to examine relative state abundances, line emission intensity, and other properties. With these diverse models, we expect to have a better understanding of PDRs and expand our scope in the chemical architecture and evolution of AGB stars and other UV-irradiated regions.

