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Rotational and vibrational temperatures of Hydrogen nonequilibrium plasmas from Fulcher band emission spectra

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A roto-vibrational specific corona model is discussed for the simulation of the Fulcher spectrum in low pressure Hydrogen discharges. The model takes into account the processes of electron-impact excitation, spontaneous emission and predissociation and allows to simulate the molecular Fulcher spectrum in the [600:640] nm range.
The model is applied to the analysis of emission spectra collected at the SPIDER negative ion source. It will be shown that the model can reproduce measured spectra with good accuracy and thus provide an estimation of the vibrational and rotational temperatures of the molecular component in discharge; the latter can also be taken as a good estimation of the gas temperature. Knowledge of these quantities is important for the accurate modelling of the plasma kinetics.
Results are presented for different values of the discharge applied power and source pressure and for the driver and expansion regions of the discharge, thus providing a characterization of the rotational and vibrational temperatures of H_2 as a function of these machine parameters.

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