RAMAN SCATTERING STUDIES OF VIBRATIONAL ENERGY DISTRIBUTION IN LASER SUSTAINED PLASMAS

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It is well known that weakly ionized plasmas can be produced by CO laser irradiation of mixtures of CO in Argon. CO molecules in low vibrational levels directly absorb the CO laser radiation and undergo collisional up-pumping processes such as

$$\mathrm{CO}(v) + \mathrm{CO}(w) \rightarrow \mathrm{CO}(v+1) + \mathrm{CO}(w-1)$$

If up-pumping is sufficient to populate CO vibrational levels of order 35 or greater, then electron production occurs through what are known as energy pooling reactions. In the presence of N_2 and/or O_2, interspecies vibrational energy transfer can quench the highly excited vibrational distribution. In this work, we report spontaneous Raman scattering measurement of N_2 and O_2 vibrational distribution in CO laser sustained, non-equilibrium plasmas. Experimental population data is compared to master equation modeling predictions.