VIBRATIONALLY EXCITED CARBON MONOXIDE PRODUCED VIA A CHEMICAL REACTION BETWEEN CARBON VAPOR AND OXYGEN

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Measurements of the vibrational distribution function of carbon monoxide produced via a reaction between carbon vapor and molecular oxygen has shown a total population inversion on vibrational levels 4-7. Carbon vapor, produced using an arc discharge to sublimate graphite, is mixed with an argon oxygen flow. The excited carbon monoxide is vibrationally populated up to level v=14, at low temperatures, T=400-450 K, in a collision-dominated environment, 15-20 Torr, with total population inversions between v=4-7. The average vibrational energy per CO molecule formed by the reaction is 0.6-1.2 eV/molecule, which corresponds to 10-20% of the reaction enthalpy. Kinetic modeling of the flow reactor, including state specific vibrational processes, was performed to infer the vibrational distribution of the products of the reaction. The results show viability of developing of a new chemical CO laser from the reaction of carbon vapor and oxygen.