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Rotational Non-Equilibrium of CO Excited States in Microwave Discharge CO_2 Plasma SHOTA YAMADA, YUKI MORITA, ATSUSHI NEZU, HIROSHI AKATSUKA, Tokyo Institute of Technology — Carbon dioxide plasmas are widely studied for practical engineering. For example, they are applied to CO_2 laser technologies and considered as the decomposition process of CO_2 into CO, etc. However, in these plasmas containing CO_2 or CO, the excitation kinetics of electronically excited states of the CO molecule are not fully understood yet. In this study, spectroscopic characteristics of the CO Angstrom band in microwave discharge CO_2 plasma is investigated, and a discussion comparison the third positive system (3^{rd} PS) of CO. For this purpose, vibrational temperature T_v and rotational temperature T_r of the CO excited states in low-pressure CO_2 plasma are investigated. Angstrom band spectra of CO are calculated theoretically as functions of T_v and T_r, after which a fitting is conducted to analyze experimental results. The best theoretical fitting is obtained using two-rotational temperature, a bulk component $T_r = 0.04$ eV with high energy tail $T_r = 0.17$ eV, occupying 3/4 and 1/4 fraction of the number density, respectively. For the vibrational temperature $T_v \approx 0.4$ eV is found as a unique value. From comparing these results with the CO 3^{rd} PS values, it is turned out that there is a difference of 0.11 eV as to the value of T_r.

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