第76回応用物理学会秋季学術講演会 講演予稿集 (2015 名古屋国際会議場)

N_2–H_2混合気体放電プラズマ中 NH 分子振動と回転温度の影響

Vibrational and Rotational Temperature Dependence of NH in Microwave N_2-H_2 Mixture Gas Discharge

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The N_2-H_2 mixture discharge has been investigated since over 50 years ago. Recently it become hot topics again because its widely usage in nitric processes and some industrial applications. Since low-temperature and low-pressure plasma can provide peak-resoluble spectrum, it is a very helpful method to diagnose plasmas and to investigate molecular properties. In this research, we obtained the spectra of N_2-H_2 mixture discharges both theoretically and experimentally.

In N_2-H_2 mixture discharge, N2 2nd positive system (2PS) and NH 336-nm system can be observed. The N_2 2PS ranges from 300-400 nm and NH 336-nm system ranges around 336 nm, which originates from the electric transitions from N2 $C\,^3\Pi$ to $B\,^3\Pi$ and NH $A^3\Pi$ to $X^3\Sigma^-$ molecular states.

Figure 1 shows the band spectra of N_2-H_2 mixture discharge. By fitting the spectra with the theoretical calculations, the vibrational and rotational temperature can be obtained. And after some analysis, we supposed two reactions that generats the NH $A^3\Pi$ excited state as followings,

$$NH_3 + hv \rightarrow NH(A^3\Pi) + H_2, \quad (1)$$

$$NH(a,b) \rightarrow NH(A^3\Pi) + energy, \quad (2)$$

More detail explanations will be presented in the conference.

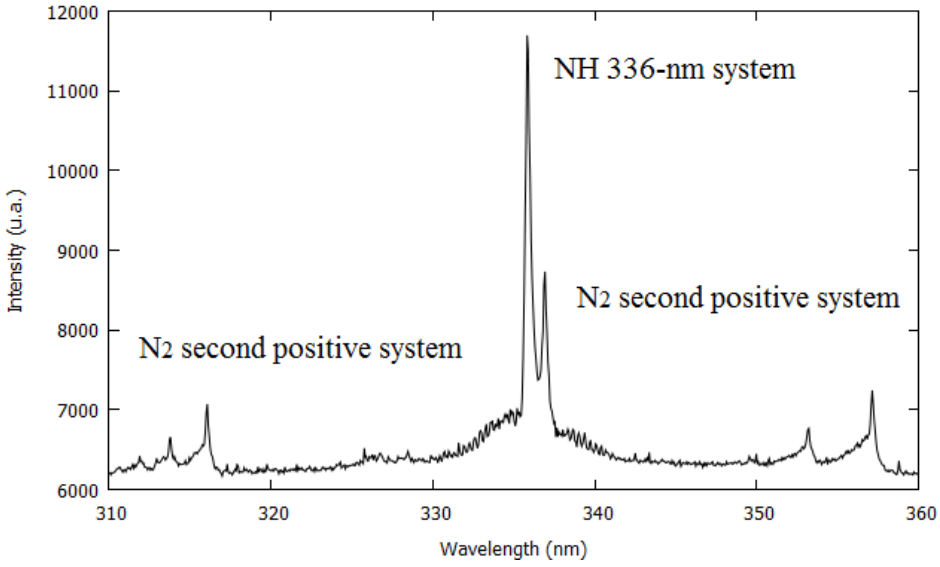

Fig. 1. Experimentally observed spectra over the 310-360-nm wavelength range with H_2 partial pressure at 90%. The 2nd positive system of N_2(310~320 nm and 350~360 nm) and 336-nm system (330~340 nm) of NH are specified. The discharge pressure is 1 Torr.