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Two-dimensional Simulations of a VHF H_2 Plasma for Different Discharge Gaps KUAN-CHEN CHEN, KUO-FENG CHIU, Department of Materials Science & Engineering, Feng-Chia University, Taichung, 40724, Taiwan, KOHEI OGIWARA, LI-WEN SU, KIICHIRO UCHINO, YOSHINOBU KAWAI, Interdisciplinary Graduate School of Engineering Sciences, Kyushu University, Kasuga, Fukuoka 816-8580, Japan — A capacitively coupled plasma (CCP) is widely used for plasma applications. Since a tandem silicon thin film solar cells using a VHF plasma source was proposed, a study of a VHF plasma has been popular in solar cell fields. In addition, a high speed deposition of microcrystalline silicon has been achieved by a high pressure depletion method. In plasma etching, a two frequency CCP has been operated at relatively high pressures. Thus, it is important to examine the characteristics of a capacitively coupled VHF plasma at high pressures. However, a spatial distribution of the plasma parameters at a narrow gap has not been measured because of the measurement difficulty. Thus, we examined an axial distribution of the plasma parameters for different discharge gaps by the simulation using Plasma Hybrid Module. A VHF voltage (frequency: 60 MHz) was applied on parallel plate electrodes The discharge gap was varied from 8 mm to 20 mm. The electron temperature around the electrode was higher than that at the center. When the applied voltage was increased, the electron density increased while the electron temperature decreased near the center. The gap dependence of the plasma parameters was also studied.

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