

고주파유도결합에 의해 여기된 물플라즈마로부터 고효율 수소생산을 위한 메탄가스 첨가효과

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Effect of CH₄ addition to the H₂O plasma excited by VHF ICP for production of H₂

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Abstract : Hydrogen was produced by water plasma excited in very high frequency inductively coupled tube reactor. Mass spectrometry was used to monitor gas phase species at various process conditions. Water dissociation rate depend on the process parameters such as ICP power, flow-rate and pressure. Water dissociation percent in ICP reactor decrease with increase of chamber pressure and H₂O flow rate, while increase with increase of ICP power. In our experimental range, maximum water dissociation rate was 65.5% at the process conditions of 265 mTorr, 68 sccm, and 400 Watt. The effect of CH₄ addition to a water plasma on the hydrogen production has been studied in a VHF ICP reactor. With the addition of CH₄ gas, H₂ production increases to 12% until the CH₄ flow rate increases up to 15 sccm. But, with the flow rate of CH₄ more than 20 sccm, chamber wall was deposited with carbon film because of deficiency of oxygen in gas phase, hydrogen production rate decreased. The main roles of CH₄ gas are to reacts with O forming CO, CHO and CO₂ and releasing additional H₂ and furthermore to prevent reverse reaction for forming H₂O from H₂ and O₂. But, CH₄ addition has negative effects such as cost increase and CO_x emission, therefore process optimization is required.

Key Words : H₂O Plasma, VHF ICP, H₂ production, CH₄ addition