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Numerical Confirmation of the Feasibility to Generate Uniform Large-Area VHF Plasmas by Launching a Travelling Wave HSIN-LIANG CHEN, YEN-CHENG TU, CHENG-CHANG HSIEH, WEN-FA TSAI, CHI-FONG AI, Physics Division, Institute of Nuclear Energy Research (INER), KEH-CHYANG LEOU, Department of Engineering and System Science, National Tsing Hua University — Large-area VHF (very high frequency) PECVD has been demonstrated to be an effective approach to improve the throughput of thin film silicon solar cell industry because it could increase the deposition rate without deteriorating the film quality. An innovative approach, i.e., creating a traveling wave in the discharge region by simultaneously launching two specific standing waves, is proposed to generate uniform large area VHF plasmas. The feasibility of this approach has been successfully verified by numerical simulation in this study. The spatial distribution of electric field for each standing wave is separately controlled by the phase difference (φ) between the corresponding two feeding points placed on opposite sides of electrode and designated to produce a specific standing wave pattern. The simulation results indicate that the standing wave patterns obtained with φ equal to 0^o and 180^o waves are spatially out of phase by 90^o and the corresponding standing patterns are consistent with various experimental works. By launching these two standing waves at the same time, a traveling wave can be generated once the conditions that these two standing waves must possess the same amplitude and be 90^o out of phase in terms of time are also fulfilled. To provide useful information for diagnostics, how the deviations from the necessary conditions would affect discharge patterns are discussed in details.

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