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2.45 GHz Surface Wave Plasma Source Development for Plasma Flood Gun

In a modern ion implanter, plasma flood gun (PFG) is used to neutralize wafer charge during doping process, preventing the breakdown of floating wafers caused by the space charge accumulation. Surface wave plasma (SWP) source that has a simple structure and no hot filament requirement, which can avoid metal pollution, is a potential competitive prospect as a PFG for ion implanter. At Peking University (PKU), SWP source research based on 2.45 GHz microwave is launched recently. Our aim is to establish a high intensity plasma with gas pressure in 10^{-3} Pa order that are critical required by ion implanter. To achieve this goal, we established a two-dimensional axisymmetric discharge model to optimize the structural parameters of the SWP source. Counting in various physical parameters in a 2.45GHz SWP source, such as electron temperature, electron density, electric field mode, energy deposition and electron generation rate, a prototype SWP source with RF coupling through a cylindrical dielectric antenna was designed and tested. In subsequent continuous wave (CW) experiments, the extracted electron beam can be more than 90 mA at input RF power of 500 W and argon gas pressure of 5.5×10^{-3} Pa. Detail will be presented in this article.

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