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A novel linear microwave plasma source using circular TE_{11} mode and comparison with co-axial TEM mode JU-HONG CHA, HO-JUN LEE, Department of Electrical Engineering, Pusan National University — For conventional linear microwave plasma sources with co-axial TEM waveguide, the wave electric field is directed perpendicular to the quartz window surface. There is a relatively large resistive loss on the window, and the electron loss increases due to the field direction. To improve performances of linear microwave plasma sources, a novel linear microwave plasma source suitable for deposition and etching processes has been developed. In the proposed plasma source, circular TE_{11} mode was used for plasma generation. After mode conversion from rectangular TE_{10} to circular TE_{11}, 2.45 GHz microwave power is transferred to the plasma through the continuous line slot antenna along the wave propagation direction. The direction of radiated electric field was made to be almost parallel to the quartz window to reduce the electron loss. Properties of the plasma source are investigated by fluid simulation and home-made single Langmuir probe, which confirmed that proposed source has better plasma generation efficiency compared with the conventional source. For 300mTorr Ar plasma with 0.6kW microwave power, plasma density improvement about 200% was achieved. In addition, it was observed that the position of the maximum electron density is shifted away from the window surface.

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