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Characterization of inductively coupled Ar and Ar/CH4 plasma using tuned single Langmuir probe and fluid simulation JU-HONG CHA, MOON-KI HAN, KWON-SANG SEO, DONG-HYUN KIM, HAE JUNE LEE, HO-JUN LEE , Department of Electrical and Computer Engineering, Pusan National University — An inductively coupled plasma source driven by 13.56MHz was prepared for the deposition of a-C:H and hydro-fluorocarbon thin film. Properties of the plasma source are investigated by fluid simulation including Navier-Stokes equations and home-made tuned single Langmuir probe. Signal attenuation ratios of the Langmuir probe at first and second harmonic frequency were 49dB and 46dB respectively. Dependencies of plasma parameters on process parameters were well agreed with simulation results. It was found that gas flow field significantly affect spatial distribution of electron density and temperature even in inert gas feeding case. Higher electron density and lower temperature was observed near the gas inlet area. Ar/CH4 plasma simulation results shown that hydrocarbon radical densities have their lowest value at the vicinity of gas feeding line due to high flow velocity. For input power density of 0.07W/cm3, CH radical density follows electron density distribution. On the other hand, central region of the chamber become deficient in CH3 radical due to high dissociation rate accompanied with high electron density. The result suggest that optimization of discharge power is important for controlling deposition film quality in high density plasma sources.

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