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Experimental study of a very high frequency (162MHz) capacitively coupled multi-tile electrode plasma source NISHANT SIRSE, BERT ELLINGBOE, Dublin City University, Ireland — In the recent years, plasma discharges excited at very high frequency (30-500MHz) has attracted much attention due to its ability to perform etching and deposition of large area substrates. VHF discharges yield high plasma density and low electron temperature and enable enhanced plasma dissociation. However, the plasma chemistry and power coupling mechanism in VHF discharges is not fully understood. In this article, we present an experimental study on nitrogen plasma produced by a VHF (162 MHz) multi-tile electrode. Electron density profile and gas temperature (rotational and vibrational) are measured as a function of rf power (100-1500W) and gas pressure (50mTorr-1Torr). Tile centre and Tile edge data are presented to realize the power coupling mechanism at different position in the multi-tile electrode discharge. It is observed that the plasma density increases monotonically with a rise in VHF power level at both positions while decreasing with an increase in the operating gas pressure. At a low gas pressure (50mTorr), plasma density profile shows a maximum at the tile centre and minimum at the tile edge position, whereas, at high gas pressures (500mTorr – 1Torr) edge effects are observed. Measured rotational temperature ($\sim$ 350-450K) is slightly above room temperature. Vibrational temperature, measured from 6500-8000K, is increasing initially with a rise in rf power (<1kW) and then saturates (above 1 kW). Similar to the plasma density profile, high vibrational temperature is measured at the tile edge compared to the tile centre.

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