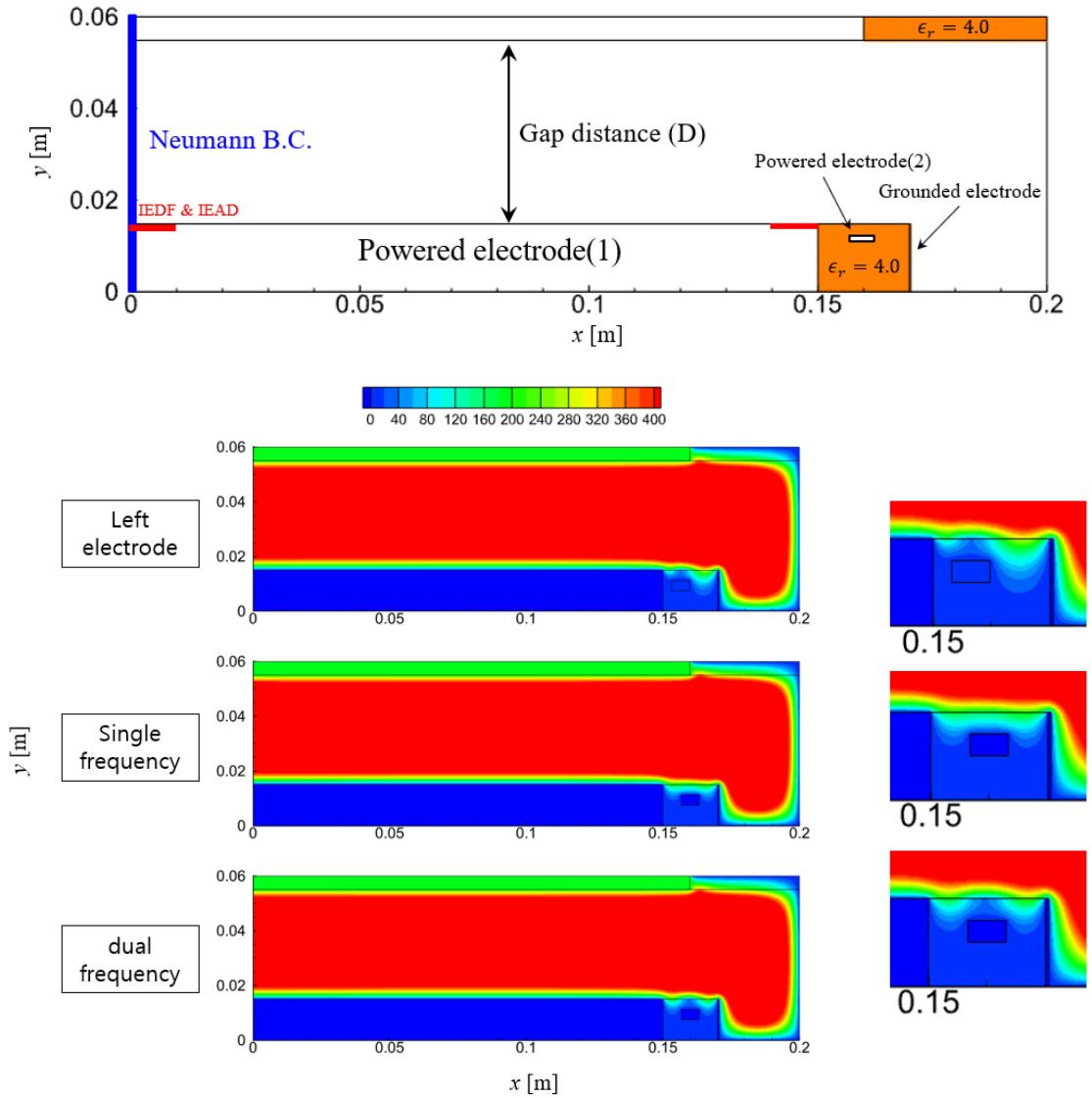
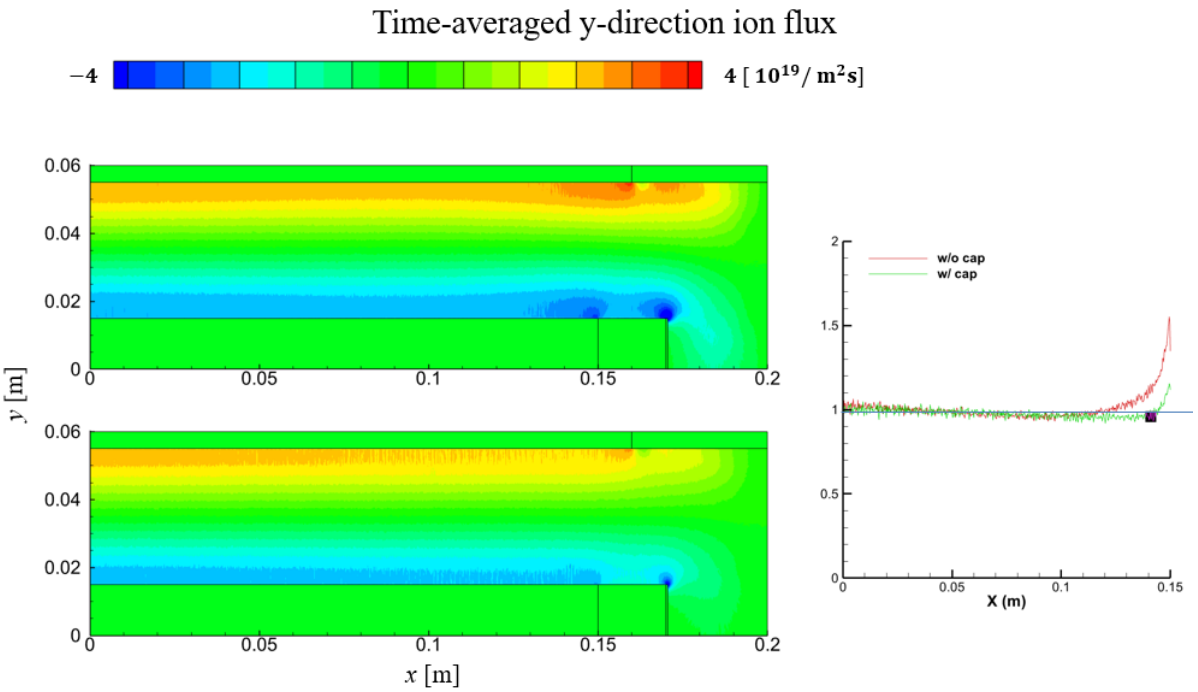
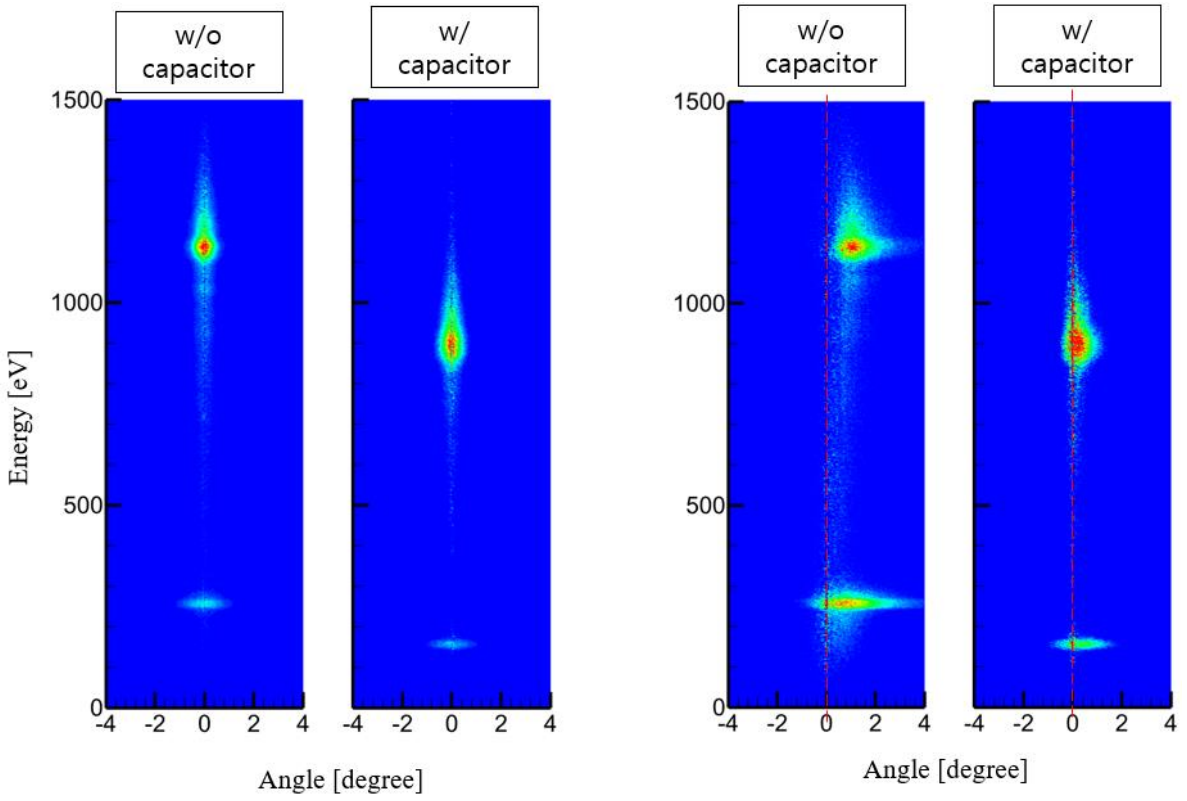
The control of the ion angle and energy distribution by an embedded electrode in a focus ring for a capacitively coupled RF plasma

Seoi Choi and Hae June Lee*

With the recent advancements in semiconductor processes reaching the nanoscale, research is underway to enhance the uniformity of plasma in plasma etching reactors. The non-uniformity of the etch process is noticeable at the edge of the wafer due to inhomogeneous electrical characteristics. We investigate a mechanism to control the plasma sheath above the wafer edge for a uniform etching process over the dielectric focus ring by changing the electric field and ion flux uniformly across the wafer surface using a two-dimensional particle-in-cell simulation parallelized with a GPU. An appropriate waveform on the electrode inserted inside the focus ring changes the sheath oscillation and ion flux to improve the ion energy and angular distributions (IEADs) to achieve a better etch rate.







IAEDF at the center

IAEDF at the edge