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Electromagnetic Particle-in-Cell Simulation of Large Area High-Frequency Capacitive Coupled Plasmas for the Reduction of Standing Wave Effects[1] JIN SEOK KIM, IN CHEOL SONG, SEOK WON HWANG, HO-JUN LEE, HAE JUNE LEE, Pusan National University, PNU PLASMA RESEARCH CENTER TEAM — A finite difference time domain (FDTD) method was adopted to investigate the electric-field distributions depending on the driving frequency of a 450-mm Capacitive Coupled Plasma (CCP) reactor. High frequency wave contains a short wavelength which induces standing wave effects in the CCP reactor. The induced standing waves make non-uniform electric field distributions which causes bad effects on the uniformity of plasma processing. This presentation shows the plasma density uniformity depending on electrode structures and other factors. The investigation of standing wave effect is coupled with the electromagnetic particle-in-cell (PIC) simulation. A PIC simulation shows very high accuracy compared with fluid simulations and gives more information for electron and ion energy distributions, but has a disadvantage of slow speed caused by individual calculation of lots of computational particles. A computation method using graphic processing units makes it possible to establish a low-cost and low-power personal super computer. In order to overcome the heavy computation problem of a PIC method, we have developed a two-dimensional parallelized PIC code utilizing GPUs. In this presentation, the coupled simulation is presented using FDTD electromagnetic wave solver and PIC method.

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