

Quantemol-D/HPEM example 2: Argon capacitively-coupled plasma (CCP) with electron energy equation (EEE)

Dr. Brent Walker

September 7, 2011

We consider a simple capacitively-coupled plasma based on the single gas Ar, firstly with the Boltzmann treatment of the electrons. The version of HPEM underlying Quantemol-D is that of March 2011 (“mar11”).

The details of the calculation are shown in Table 1.

Pressure	100 mTorr
RF Power	100 Watt (variable)
Electron treatment	Boltzmann
Flow rate	300 sccm

Table 1: Settings for Ar CCP example.

The simulation chamber is shown in Figure 1. As for the inductively-coupled plasma (ICP) in Example 1, the wafer is coloured red in the diagram. This time however there are no coils. The gases enter the chamber through the purple area at the top. The yellow stand upon which the wafer sits is powered with an RF bias of amplitude 300 V, frequency 10 MHz.

The distribution of particles arriving at the surface, as functions of the incident angle and energy, determined using the plasma chemistry Monte Carlo (PCMC) method, are shown in Figure 2.

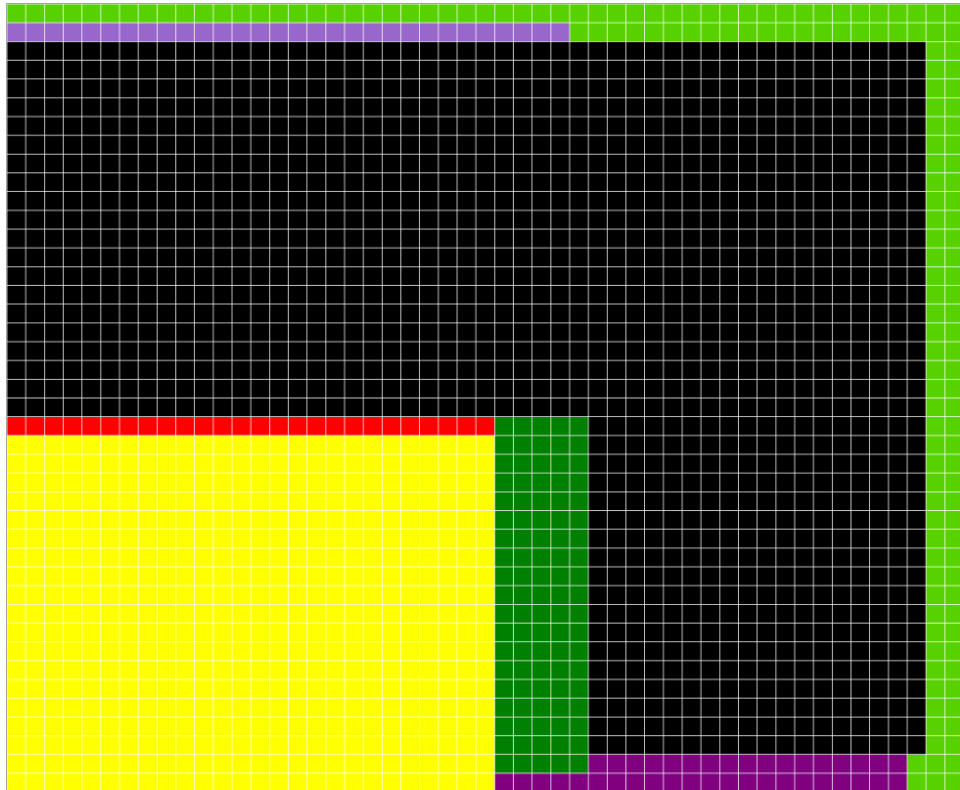


Figure 1: Model for Ar CCP plasma chamber.

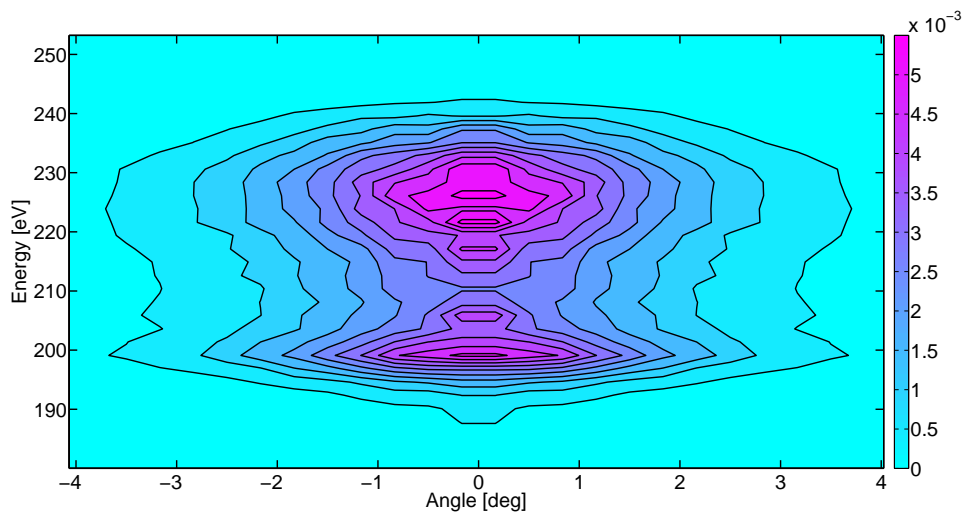


Figure 2: Distribution of positive ions arriving at the wafer as a function of angle and energy, for CCP example, with Boltzmann treatment of the electrons. These data have been calculated using the plasma chemistry Monte Carlo (PCMC) module.