Role of Surface Current and Magnetic Field at Directed Extreme Ultraviolet Generation in Plasma Discharge for Lithography

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Role of surface current and magnetic field in a plasma discharge source of the extreme ultra-violet (EUV) is considered. The problem of the EUV generation in economic compact systems is important and EUV is widely applied. In particular, this radiation is very important for lithography. High-current pulsed plasma diode in tin vapor is used. In this system at certain conditions the electrical double layer is formed, the low-frequency instability is developed, the electron beam is accelerated. The instability leads to necessary for EUV generation additional plasma electron heating. Also specific electron dynamics in fields of oscillations provides formation of low-energy electrons, necessary for EUV generation.

It is shown that the direction of EUV radiation can be controlled by magnetic field of short coil. Magnetic field of some value leads to plasma cloud formation in needle – kind and to longitudinally directed extreme ultraviolet generation. Magnetic field of another value leads to volume plasma cloud and to radially directed extreme ultraviolet generation.

Current distribution strongly depends on distribution of substance in space. Controlling dynamics of preliminary plasma leads to controlling current distribution. Current, curried near dielectric surface, separates from the surface in some position relative to anode, meets with current of needle-plasma, forming pinch.