

# Balanced magnetic field in magnetron sputtering systems

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**Abstract:** Discharge characteristics of the planar axial magnetron sputtering systems (MSS) with different dimensions and level of unbalance of their magnetic systems were investigated. Additional coils were used to change the level of the magnetron unbalance (the configuration of the magnetic field over the target surface). For these configurations of the magnetrons, the dependencies of the discharge voltage, substrate ion current density, deposition rate, minimal working pressure on MSS geometrical unbalance ( $K_G$ ) were received. Based on the data obtained it was determined that for all MSS, independent of the dimensions of magnetic system, the magnetic field of balanced configuration is formed at  $K_G = 1.235\text{--}1.27$ , and the discharge voltage has maximal conductivity. If  $K_G$  is decreased the magnetic field with unbalanced configuration of second type is formed, at greater  $K_G$  the magnetic field of the first type is developed. For all investigated configurations of the magnetrons the minimal working pressure can be reached at a lower level of the geometric unbalance ( $K_G = 1.02\text{--}1.125$ )

compared to the minimal discharge voltage, and it is independent of the dimensions of magnetron's magnetic system.

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