Título: Plasma Engineering: Applications From Aerospace To Bio And Nanotechnology

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Sinopsis

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Plasma engineering applies the unique properties of plasmas (ionized gases) to improve processes and performance over many fields, such as materials processing, spacecraft propulsion, and nanofabrication. Plasma Engineering considers this rapidly expanding discipline from a unified standpoint, addressing fundamentals of physics and modeling as well as new real-word applications in aerospace, nanotechnology, and bioengineering.

The book starts by reviewing plasma particle collisions, waves, and instabilities, and proceeds to diagnostic tools, such as planar, spherical, and emissive probes, and the electrostatic analyzer, interferometric technique, and plasma spectroscopy. The physics of different types of electrical discharges are considered, including the classical Townsend mechanism of gas electrical breakdown and the Paschen law. Basic approaches and theoretical methodologies for plasma modeling are described, based on the fluid description of plasma solving numerically magnetohydrodynamic (MHD) equations and the kinetic model particle techniques that take into account kinetic interactions among particles and electromagnetic fields.

Readers are then introduced to the widest variety of applications in any text on the market. Space propulsion applications such as the Hall thruster, pulsed plasma thrusters, and microthruster are explained. Application of low-temperature plasmas in nanoscience and nanotechnology, another frontier in plasma physics, is covered, including plasma-based techniques for carbon-based nanoparticle synthesis (e.g., fundamental building blocks like single-walled carbon nanotubes and graphene). Plasma medicine, an emerging field studying plasmas for therapeutic applications, is examined as well. The latest original results on cold atmospheric plasma (CAP) applications in medicine are presented, with a focus on the therapeutic potential of CAP with a in selective tumor cell eradication and signaling pathway deregulation.

The first textbook that addresses plasma engineering in the aerospace, nanotechnology, and bioengineering fields from a unified standpoint

Includes a large number of worked examples, end of chapter exercises, and historical perspectives

Accompanying plasma simulation software covering the Particle in Cell (PIC) approach, available at http://www.particleincell.com/blog/2011/particle-in-cell-example/