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Development of a simulation tool for a plasma generation based on the dual property of electrons**Shinichiro Kitamoto and Petros Abraha**
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This research presents the development of a simulation tool that characterizes and optimizes the plasma characteristics of a new plasma device based on the dual property of electrons. The device is specifically tailored to produce uniform and large-volume plasma that can harden the surface of large-sized or large-number of mechanical parts. The thin nitride layer is formed by the diffusion of interstitial nitrogen atoms to within a few tens of micrometers into the bulk material. Evaluation of the performance of the plasma device in attaining uniform and large-volume treated materials requires extensive experimental work, modeling and numerical simulation in addition to plasma diagnostics. In this research, the principle of the plasma generation and the operating conditions of the plasma device, are considered in constructing the simulation tool that illustrates the qualitative relations between the plasma parameters and the magnitude and uniformity of the plasma. Numerical simulation of three sequential regions namely, particle, wave and particle regions are modeled to give the total framework. In the two particle regions, Particle-In-Cell and Monte-Carlo-Collusion methods are carried out to determine the particle energy and position within the plasma chamber. While in the wave region, Fresnel theory is used to determine the diffracted electron intensity distribution. In combining the results of the particle and wave regions, the plasma characteristic of the device is holistically determined.

Biography

Shinichiro Kitamoto has completed his Bachelor's degree from Meijo University School of Mechanical Engineering and currently pursuing his graduation at Meijo University School of Mechanical Engineering.

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