NON-CIRCULAR CROSS-SECTION GEOMETRY EFFECTS ON PERTURBED RADIAL MAGNETIC FIELD IN DAMAVAND TOKAMAK

Mehdi Harzchi, Naser Alinejad

Abstract. Linear perturbation of the MHD equation in the flux coordinate system is derived for non-circular cross section of tokamak plasma. The coefficients of derived equation are functions of cross-section geometrical parameters such as elongation, triangularity, Shafranov shift, etc. This equation is solved for non-circular cross section of Damavand tokamak plasma and from which the perturbed magnetic flux and the perturbed radial magnetic field are calculated numerically. The effects of non-circular cross-section parameters on our results are shown and these results are compared to the results from common MHD equation in the cylindrical coordinate system by consideration of circular cross section approximation.

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PLASMA TREATMENT OF KEVLAR AND NOMEX

Marie Štěpánková, Jan Grégr, Jakub Wiener,
Jana Müllerová, Jana Grabmüllerová

Abstract. The influence of plasma treatment of Kevlar and Nomex fibers is discussed. Kevlar and Nomex fibers were exposed to plasma for different time ranges up to five minutes. Samples of fibers were treated in the plasma source of diffuse coplanar surface barrier discharge. The air was an operational gas. The structure and the appearance of Kevlar and Nomex fibers are observed by mean scanning electron microscopy. The alternative method to value fibre surface is infrared spectroscopy. For this analysis we used attenuated total reflectance Fourier transform infrared spectroscopy. To detect changes in chemical composition of the fiber surface was performed by X-ray photoelectron spectroscopy analysis.

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ABSOLUTE VACUUM UV EMISSION FROM THE EFFLUENT OF AN ATMOSPHERIC PRESSURE PLASMA JET WITH Ar/Xe AND Ar/Kr MIXTURES IN AMBIENT AIR

Hartmut Lange, Rüdiger Foest,
Jan Schäfer, Klaus-Dieter Weltmann

Abstract. The vacuum ultraviolet emissions from 115 to 200 nm from an atmospheric pressure plasma jet excited by radio frequency at 1.2 MHz are analysed. The discharge is operated under ambient atmosphere and fed with pure Ar and mixtures of Ar and Xe or Kr (up to 20 %). For the pure Ar discharge, a prevailing Ar_2^* excimer second continuum is observed in the region of 120 to 135 nm, which decreases when Xe or Kr is added to the feed gas. In contrast, the resonant emission of Xenon at 147 nm and Kr at 124 nm becomes dominant for a small admixture (0.5 %) of Xe or Kr respectively. For higher admixtures of Xe (10 %), the second continuum at 172 nm appears. The recorded spectra include also several N I emission lines, the O I resonance line and H I line, due to ambient air. The absolute radiance is determined for various gas mixtures and axial distances away from the plasma source and presented along with the integrated spectral distribution. Maximum values of 2.2 $\mathrm{mW\,sr^{-1}mm^{-2}}$ are reached in pure Ar and at the distance of 4 mm from the outlet nozzle of the discharge. However, by adding small admixtures of Kr and Xe in particular, the spectral distribution is effectively changed.

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LANGMUIR PROBE CHARACTERIZATION OF LASER-GENERATED PLASMAS

David Mascali, Lorenzo Torrisi,
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Abstract. Non-equilibrium plasmas expanding in vacuum at supersonic velocities produced by interaction between the 9 ns Nd:YAG laser and metallic bulk targets (Ta, Ag, Fe, Ti) are investigated. The plasma plume is emitted mainly along the normal to the irradiated target surface and the plasma temperature and density are strongly dependent on the expansion time and distance from the target surface. Plasma characterization measurements are performed *in situ* with a millimetric Langmuir probe. The probe tip current vs. the polarization voltage is measured as a function of the expansion time. 3D plots of the probe I vs. V curve with respect to the time are reconstructed in order to describe the plasma plume dynamics. Investigations on the plume structure, electron density, electron temperature and ion saturation currents are reported. Obtained results indicate that high temperature and density gradients are present and that strong ion accelerations occur. The temperatures and densities measured by means of the Langmuir probe have been compared with those obtained by other analysis techniques and estimations of such parameters in proximity of target surface (i.e. in the early stages of plasma plume expansion) are also given.

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NEW ATMOSPHERIC PRESSURE MICROWAVE MICROPLASMA SOURCE

Mariusz Jasiński, Zenon Zakrzewski, Jerzy Mizeraczyk

Abstract. A simple microwave microplasma source (MMS) for the generation of argon microplasma at atmospheric pressure is presented. The presented MMS can be used in practical applications including the gas cleaning, microwelding, surface modifications and biomedical applications. The MMS, of a coaxial design, was supplied through 50 Ω coaxial line terminated with a coaxial MMS from a typical 2.45 GHz microwave magnetron generator. All experimental tests were performed with argon at a flow rate from 1 to 20 l/min and absorbed microwave power from 10 to 80 W. The microplasma occurred in the form of a small plasma jet. The length and diameter of microplasma ranged from 1.5–14 mm and 0.5–1.5 mm, respectively, depending on the discharge condition. The temperature of the microplasma could be changed in the range of 30–1200 °C by varying the gas flow rate and/or absorbed microwave power.

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MATHEMATICAL MODEL OF MACHINING PROCESS WITH REGULATION OF PARTICULAR PARAMETER

Radoslav Krehel'

Abstract. A novel approach to the simulation of the dimensional wear of cutting tools with a subsequent element of correction in limit boundaries of parametrically determined optimal shifts is presented and discussed. Described in details is, however, only one aspect belonging to the polynomial transform of experimentally found discrete values of the knife point positions to a continuous functional form, compatible with used SW. Special attention is paid to the proposal of the simulation scheme working with the mathematical model in the simulation environment with particular values of the given simulation parameters.

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GENERATION OF HOMOGENEOUS AND HIGH-GRADIENT MAGNETIC FIELDS BY SYSTEMS OF PERMANENT MAGNETS

Aleš Hála

Abstract. Discussed is generation of highly uniform and highly gradient static magnetic fields by magnetic circuits containing permanent magnets. Described are the most frequently used magnetic circuits and formulated their mathematical models. The crucial point of the paper is represented by solution of several typical examples, discussion of their result and their validation by measurements on a simple experimental stand.

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IMPEDANCES OF FINITE-LENGTH ISOLATED PHASE BUSDUCTS

Zygmunt Piątek

Abstract. The self and mutual impedances of a three-phase high current transmission line with isolated phases are calculated. The phase conductors and their sheaths are presented as a system of parallel conductors, whose voltage drops are described by a system of three-dimensional integral Fredholm's equations of the second kind with weakly singular kernels. Next, defined are self and mutual impedances of the phase conductors and sheaths of a finite length gas-insulated transmission line with isolated phases (GIL). These impedances are expressed in terms of the densities of self currents as well as densities of currents induced in the conductors by magnetic field of other phase conductors. This allows including the skin and proximity effects. The proximity effect between the phase conductor and its sheath and sheaths of the neighbouring phases is also taken into account. The computation of self and mutual impedances for the case of a single-phase GIL and a system of two non-coaxial parallel tubular conductors is discussed in detail. Analytical formulae for self and mutual impedances of the above systems are obtained by determining the same quantities for a three-phase flat GIL with isolated phases.

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