1. Determination of helium number densities in high-frequency electrodeless plasma.

Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment
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Available online 9 April 2010.

Abstract:
The number densities of He first excited states \(2^3S_1\), \(2^1S_0\), \(2^3P_{0,1,2}\), and \(2^1P_0\) were measured by absorption and self-absorption methods. The emission lines in the range 290–730 nm were used to determine the number densities of He metastable and resonant states of inductively coupled high-frequency electrodeless lamps filled with helium at pressure 0.1 Torr. The obtained number densities of helium metastable levels \(2^3S_1\) and \(2^1S_0\) are \(2 \times 10^{12}\) and \(3 \times 10^{11}\) cm\(^{-3}\), respectively. For the \(2^3P_{0,1,2}\) and \(2^1P_0\) levels the determined number densities are ten times smaller than that of the metastable levels. Values of number densities from measurements using both methods are in good agreement.

2. Deconvolution of the spectral line profiles for the plasma temperature estimation

Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment
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Available online 13 February 2010.

Abstract:
The Hg 253.7 nm spectralline profiles, emitted from the mercury–argon high-frequency electrodeless discharge lamps (HFEDL) have been measured by means of a high-resolution scanning Fabry–Perrot interferometer at the mercury cold spot temperature value at 20 °C, different discharge current and buffer gas values. The deconvolution procedure by means of the Tikhonov's regularization method was performed to obtain the real spectralline shape. The influence of the instrumental function and absorption, real width of the Hg 253.7 nm resonance line and temperature of the radiating atoms are obtained. The results were compared with the results of the nonlinear multiparameter mathematical modeling by means of a nonlinear multiparameter \(\chi^2\) fit.

3. Plasma Temperature and Surface Studies of Argon-Hydrogen containing Low-temperature Dumbbell from Light Sources

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Abstract:
In the current study we present the plasma temperature and surface topography measurement results for dumbbell-form lamps before and after the additional training at 2.4 GHz frequency. The plasma temperature was determined from the OH emission in all three parts of the lamp (spherical, capillary and cylindrical), exciting the discharge at 100 MHz field frequency. The SiO2 glass surface topography measurements were performed with Atomic Force Microscope. The surface is much smoother when gigahertz field had been used, however no significant differences between plasma temperatures before and after the training at 2.4 GHz could be observed. It was observed that in the capillary part of the lamp the plasma temperature is lowest and the inner surface is roughest, contrary to the other parts of the lamp, where temperature is much higher and the surface smoother, showing that the plasma temperature affects surface topography as well.

4. Spatial diagnostics of Hg/Ar and Hg/Xe discharge lamps by means of tomography
http://jjap.jsap.jp/link?JJAP/50/08JB03/

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Abstract:
In this work, the diagnostics using tomography in Hg/Xe and Hg/Ar capillary lamps is presented. First, the imaging of the lamps was performed using selected emission lines of mercury, argon and xenon in different operation conditions. Thus the tomographic reconstruction was made, to determine the spatial distribution of the emitting Hg and rare gas atoms. Significant differences of the distribution of the emitting atoms have been found in vertical and horizontal operation positions. The emitting mercury atoms in the state 7S1 were differently distributed within the lamp in the vertical and horizontal lamp positions. The radial profile has demonstrated a substantial depletion of the population density from the lamp centre in the vertical operating position, whereas the profile had a flat top shape in the horizontally operating lamp. A theoretical hypothesis is proposed to explain the observed phenomenon. Strong inhomogeneous structure of the argon atom distribution was found as well.

5. A study of physical processes in microplasma capillary discharges
http://journals.cambridge.org/action/displayAbstract;jsessionid=223484D47AC9B2BFEAF035ABFA3D466B.journals?fromPage=online&aid=8418251

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Abstract:
We continue the research of low-pressure capillary discharge lamps of 500 μm in radius in Ar/Hg, Kr/Hg and Xe/Hg mixtures. In the previous paper, an experimental approach which combines the optical emission spectroscopy (OES) and tomographic methods was developed to study the capillary discharge. The present work is focused on interpretation of the tomographic reconstruction results for understanding the physical processes occurring in a capillary plasma. Analyzing the results of reconstruction, it was concluded that the radial profiles of Ar, Kr and Xe emission coefficients are in a good agreement with the Schottky theory. According to the Schottky model, ionization processes in plasma are balanced by electrons and ions transfer to the wall due to ambipolar diffusion. Using the Schottky model, the electron temperature in an Ar/Hg capillary lamp was estimated. The value of the temperature was higher in comparison with that in a large-scale Ar/Hg discharge. A simplified model describing the excited atomic states kinetics is analyzed. This model agrees with all radial profiles of emission coefficients, obtained by using a tomography approach, except one for mercury line of 546.07 nm in the Ar/Hg capillary lamp. We suppose that the simplified model did not include the processes which were important for the mercury population balance in Ar/Hg mixture. It was proposed that the transfer of high-excited mercury atoms may play an appreciable role in the Ar/Hg capillary discharge.

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6. Mercury Pollution Exploration in Latvia with High-Sensitivity Zeeman Atomic Absorption Spectrometry
https://ortus.rtu.lv/science/lv/publications/12406

Scientific Journal of Riga Technical University Environmental and Climate Technologies 7, 39 (2011)
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Abstract:
This research presents Hg pollution measurements performed in Latvia with sensitive method using Zeeman AAS analyzer RA-915+ and necessary attachments. Air in Riga city and water samples from a number of rivers and lakes of Latvia were analyzed for presence of low-level Hg concentrations. Ombrotrophic bog peat was analyzed to get insight into long-term trends. Environment in the sites sampled is relatively clean according to the results obtained, but there are local spots of pollution.

7. Determination of gas temperature of high-frequency low-temperature electrodeless plasma using molecular spectra of hydrogen and hydroxyl-radical

Journal of Quantitative Spectroscopy and Radiative Transfer
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Abstract:
In this study we determine gas temperature of He+H₂, Ar+H₂ and Ne+H₂ high frequency electrodeless lamps using intensity distribution in rotational spectra of hydrogen molecule and hydroxyl radical. The measurement results show that OH rotational spectra can be successfully used for estimation of gas temperature of the high-frequency electrodeless lamps at very small amounts of hydrogen present in plasma. The analysis of the measurement results leads to the conclusion that in “pure” plasma the applied energy is used to heat plasma, while for the plasma with hydrogen addition the energy is used in chemical reactions.

8. Measurements of SiO₂ glass surface parameters by methods of microscopy

http://iopscience.iop.org/1757-899X/38/1/012043


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Abstract:

In this research we compare chemical and plasma treatment methods for surface of SiO₂ glass. For chemical treatment of surface tequila and alcohol were used but for plasma treatment - Ar+As and Ar+Se plasmas. Surface topography was analyzed using atomic force microscope. Comparison of chemical and plasma treatment methods shows that surface treated with plasma is smoother. Because of their various chemical compositions tequila and alcohol show different results.