**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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| APPLICANT: | Chistyakov | | |
| SERIAL NO.: | 10/897,257 | GROUP NO.: | 1795 |
| FILING DATE: | July 22, 2004 | EXAMINER: | Rodney Glenn McDonald |
| TITLE: | METHODS AND APPARATUS FOR GENERATING HIGH-DENSITY PLASMA | | |

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

## AMENDMENT AND RESPONSE

Sir:

The following remarks are responsive to the Office Action mailed on March 27, 2008 in the above-identified patent application. Consideration of the following remarks, and allowance of the claims, as presented, is respectfully requested. A Petition for a three month extension of time, up to and including September 27, 2008 is submitted herewith. Authorization to charge Attorney's charge card for the extension fee and any other proper fees was given in the EFS-Web filing submission papers.

Amendments to the claims begin on page 2 of this paper.

Remarks are on page 9 of this paper.



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Amendments to the Claims

Please amend claims 45, 58, 70, and 78 as follows:

45. (Currently Amended): An apparatus for generating a strongly-ionized plasma, the apparatus comprising:

a. an ionization source that generates a weakly-ionized plasma from a feed gas contained in a chamber, the weakly-ionized plasma ~~reducing~~ substantially eliminating the probability of developing an electrical breakdown condition in the chamber; and

b. a power supply that supplies power to the weakly-ionized plasma though an electrical pulse that is applied across the weakly-ionized plasma, the electrical pulse having at least one of a magnitude and a rise-time that is sufficient to transform the weakly-ionized plasma to a strongly-ionized plasma without developing an electrical breakdown condition in the chamber.

46. (Original): The apparatus of claim 45 wherein the pulsed power supply is a component in the ionization source.

47. (Original): The apparatus of claim 45 wherein the ionization source is chosen from the group comprising an electrode coupled to a DC power supply, an electrode coupled to an AC power supply, a UV source, an X-ray source, an electron beam source, an ion beam source, an inductively coupled plasma source, a capacitively coupled plasma source, and a microwave plasma source.

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48. (Original): The apparatus of claim 45 wherein the power supply generates a constant power.

49. (Original): The apparatus of claim 45 wherein the power supply generates a constant voltage.

50. (Original): The apparatus of claim 45 wherein the power supply supplies power to the weakly ionized plasma at a time that is between about fifty microsecond and five second after the ionization source generates the weakly-ionized plasma.

51. (Original): The apparatus of claim 45 wherein the power supply supplies power to the weakly ionized plasma for a duration that is sufficient to generate a quasi-static electric field across the weakly-ionized plasma.

52. (Original): The apparatus of claim 45 wherein the cathode is generally formed in the shape of at least one circular disk.

53. (Original): The apparatus of claim 45 wherein the ionization source generates the weakly-ionized plasma from a reactive feed gas contained in a chamber.

54. (Original): The apparatus of claim 45 further comprising a magnet that is positioned to generate a magnetic field proximate to the weakly-ionized plasma, the magnetic field trapping electrons in the weakly-ionized plasma.

55. (Original): The apparatus of claim 54 wherein the magnet generates a magnetic field that is shaped to trap secondary electrons that are produced by ion bombardment.

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56. (Original): The apparatus of claim 45 further comprising a gas line that is coupled to the chamber, the gas line supplying feed gas to the strongly-ionized plasma that transports the strongly-ionized plasma by a rapid volume exchange.

57. (Original): The apparatus of claim 56 wherein the gas volume exchange permits additional power to be absorbed by the strongly-ionized plasma.

58. (Currently Amended): A method for generating a strongly-ionized plasma, the method comprising:

    a. ionizing a feed gas in a chamber to form a weakly-ionized plasma that ~~reduces~~ substantially eliminates the probability of developing an electrical breakdown condition in the chamber; and

    b. supplying an electrical pulse across the weakly-ionized plasma that excites atoms in the weakly-ionized plasma, thereby generating a strongly-ionized plasma without developing an electrical breakdown condition in the chamber.

59. (Original): The method of claim 58 wherein the ionizing the feed gas comprises exposing the feed gas to one of a static electric field, an pulsed electric field, UV radiation, X-ray radiation, electron beam radiation, and an ion beam.

60. (Original): The method of claim 58 wherein at least one of a rise time and magnitude of the electrical pulse supplied across the weakly-ionized plasma is selected to increase a density of the weakly-ionized plasma.

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61. (Original): The method of claim 58 wherein at least one of a rise time and magnitude of the electrical pulse supplied across the weakly-ionized plasma is selected to excite atoms in the weakly-ionized plasma to generate secondary electrons that increase an ionization rate of the weakly-ionized plasma.

62. (Original): The method of claim 58 wherein at least one of a rise time and magnitude of the electrical pulse supplied across the weakly-ionized plasma is selected to improve uniformity of the strongly-ionized plasma.

63. (Original): The method of claim 58 further comprising supplying feed gas to the strongly-ionized plasma to transport the strongly-ionized plasma by a rapid volume exchange.

64. (Original): The method of claim 63 wherein the transport of the strongly-ionized plasma by the rapid volume exchange permits additional power to be absorbed by the strongly-ionized plasma.

65. (Original): The method of claim 58 wherein the supplying the electrical pulse comprises applying a quasi-static electric field across the weakly-ionized plasma.

66. (Original): The method of claim 58 wherein the electrical pulse comprises a rise time that is between about 0.1 microsecond and 10 seconds.

67. (Original): The method of claim 58 wherein a peak plasma density of the weakly-ionized plasma is less than about $10^{12}$ $cm^{-3}$.

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