EXHIBIT A.06
U.S. Patent No. 7,147,759

References cited herein:

- U.S. Patent No. 7,147,759 ("'759 Patent")
- U.S. Pat. No. 6,413,382 ("Wang")
- A. A. Kudryavtsev, *et al*, Ionization relaxation in a plasma produced by a pulsed inert-gas discharge, Sov. Phys. Tech. Phys. 28(1), January 1983 ("Kudryavtsev")
- Yu. P. Raizer, Gas Discharge Physics, Springer, 1991 ("Raizer")

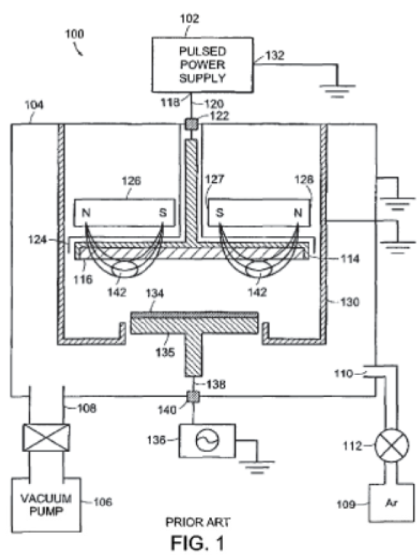
Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	**Wang in view of Kudryavtsev**
[1pre.] A magnetically enhanced sputtering source comprising:	The combination of Wang with Kudryavtsev discloses a magnetically enhanced sputtering source. Wang at Title ("Pulsed sputtering with a small rotating magnetron.").
[1a.] an anode;	The combination of Wang with Kudryavtsev discloses an anode. '759 Patent at Fig. 1  '759 Patent at Fig. 1 ("FIG. 1 illustrates a cross-sectional view of a known magnetron sputtering apparatus having a pulsed power source.") '759 Patent at 3:40-41 ("an anode 130 is positioned in the vacuum chamber 104 proximate to the cathode assembly.")

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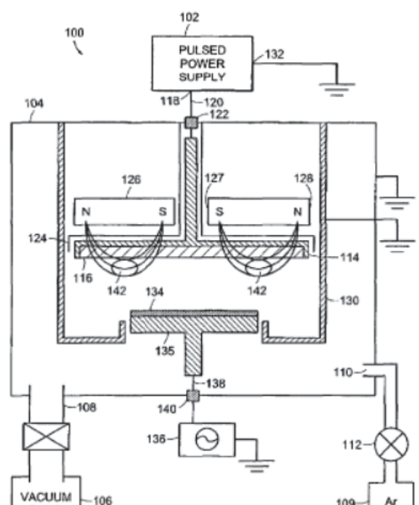
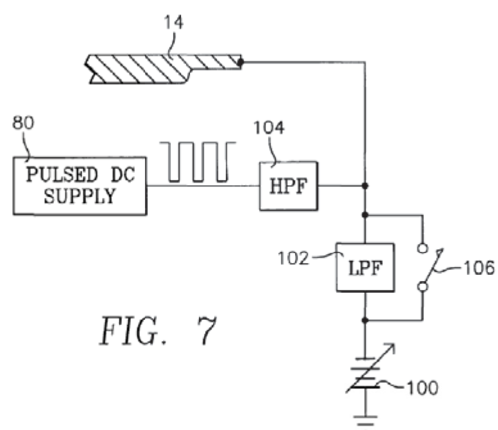
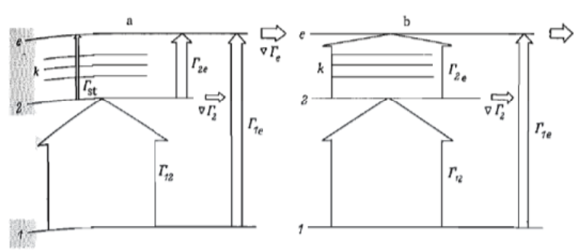
EXHIBIT A.06
U.S. Patent No. 7,147,759

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	Wang in view of Kudryavtsev
	Wang at Fig. 1 Wang at 3:66-4:1 ("A grounded shield 24 protects the chamber walls from sputter deposition and also acts as a grounded anode for the cathode of the negatively biased target 14.")
[1b.] a cathode assembly that is positioned adjacent to the anode, the cathode assembly including a sputtering target;	The combination of Wang with Kudryavtsev discloses a cathode assembly that is positioned adjacent to the anode, the cathode assembly including a sputtering target. '759 Patent at Fig. 1  PRIOR ART FIG. 1 '759 Patent at Fig. 1 ("FIG. 1 illustrates a cross-sectional view of a known magnetron sputtering apparatus having a pulsed power source.") '759 Patent at 3:40-41 ("an anode 130 is positioned in the vacuum chamber 104 proximate to the cathode assembly.") Wang at Fig. 1 Wang at 3:66-4:1 ("A grounded shield 24 protects the chamber walls from sputter deposition and also acts as a grounded anode for the cathode of the negatively biased target 14.")
[1c.] an ionization source that generates a weakly-ionized plasma proximate to the anode	The combination of Wang with Kudryavtsev discloses an ionization source that generates a weakly-ionized plasma proximate to the anode

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	Wang in view of Kudryavtsev
and the cathode assembly;	and the cathode assembly. Wang at Fig. 1. Wang at 7:17-31 ("The background power level P_B is chosen to exceed the minimum power necessary to support a plasma... [T]he application of the high peak power P_P quickly causes the already existing plasma to spread and increases the density of the plasma.") Wang at 7:19-25 ("Preferably, the peak power P_P is at least 10 times the background power P_B … and most preferably 1000 times to achieve the greatest effect of the invention. A background power P_B of 1 kW [causes] little if any actual sputter deposition.") Wang at 4:23-31 ("A small rotatable magnetron 40 is thus creating a region 42 of a high-density plasma (HDP)…") Wang at 7:47-49 ("The initial plasma ignition needs to be performed only once and at much lower power levels so that particulates produced by arcing are much reduced.").
[1d.] a magnet that is positioned to generate a magnetic field proximate to the weakly-ionized plasma, the magnetic field substantially trapping electrons in the weakly-ionized plasma proximate to the sputtering target; and	The combination of Wang with Kudryavtsev discloses a magnet that is positioned to generate a magnetic field proximate to the weakly-ionized plasma, the magnetic field substantially trapping electrons in the weakly-ionized plasma proximate to the sputtering target. '759 Patent at 3:10-12 ("FIG. 1 shows a cross-sectional view of a known magnetron sputtering apparatus 100…" that has a magnet 126.") '759 Patent at 4:4-10 [*describing the prior art Fig. 1*] ("The electrons, which cause ionization, are generally confined by the magnetic fields produced by the magnet 126. The magnetic confinement is strongest in a confinement region 142….") Wang at Fig. 1. Wang at 4:23-27 ("A small rotatable magnetron 40 is disposed in the back of the target 14 to create a magnetic field near the face of the target 14 which traps electrons from the plasma to increase the electron density.")
[1e.] a power supply generating a voltage pulse that produces an	The combination of Wang with Kudryavtsev discloses a power supply generating a voltage pulse that produces an electric field between the

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	Wang in view of Kudryavtsev
electric field between the cathode assembly and the anode, the power supply being configured to generate the voltage pulse with an amplitude and a rise time that increases an excitation rate of ground state atoms that are present in the weakly-ionized plasma to create a multi-step ionization process that generates a strongly-ionized plasma, which comprises ions that sputter target material, from the weakly-ionized plasma, the multi-step ionization process comprising exciting the ground state atoms to generate excited atoms, and then ionizing the excited atoms within the weakly-ionized plasma without forming an arc discharge.	cathode assembly and the anode, the power supply being configured to generate the voltage pulse with an amplitude and a rise time that increases an excitation rate of ground state atoms that are present in the weakly-ionized plasma to create a multi-step ionization process that generates a strongly-ionized plasma, which comprises ions that sputter target material, from the weakly-ionized plasma, the multi-step ionization process comprising exciting the ground state atoms to generate excited atoms, and then ionizing the excited atoms within the weakly-ionized plasma without forming an arc discharge. '759 Patent at Fig. 5 Wang at Figs. 6, 7.  FIG. 7 Wang at 7:61-62 ("The pulsed DC power supply 80 produces a train of negative voltage pulses."). Wang at 5:23-27 ("[The pulse's] exact shape depends on the design of the pulsed DC power supply 80, and significant rise times and fall times are expected."). Wang at 4:29-31 ("increases the sputtering rate..."). Wang at 7:19-25 ("Preferably, the peak power level P_P is at least 10 times the background power level P_B, … most preferably 1000 times to achieve the greatest effects of the invention. A background power P_B of 1 kW will typically be sufficient…") Wang at 7:31-39 ("The SIP reactor is advantageous for a low-power, low-pressure background period since the small rotating SIP

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	**Wang in view of Kudryavtsev**
	magnetron can maintain a plasma at a lower power and lower pressure than can a larger stationary magnetron. However, it is possible to combine highly ionized sputtering during the pulses With significant neutral sputtering during the back ground period."). Wang at 7:3-6 ("Plasma ignition, particularly in plasma sputter reactors, has a tendency to generate particles during the initial arcing, which may dislodge large particles from the target or chamber.") Wang at 7:47-49 ("The initial plasma ignition needs be performed only once and at much lower power levels so that particulates produced by arcing are much reduced."). Wang at 7:13-28 ("Accordingly, it is advantageous to use a target power waveform illustrated in FIG. 6… As a result, once the plasma has been ignited at the beginning of sputtering prior to the illustrated waveform…"). Kudryavtsev at 34, right col, ¶ 4 ("Since the effects studied in this work are characteristic of ionization whenever a field is suddenly applied to a weakly ionized gas, they must be allowed for when studying emission mechanisms in pulsed gas lasers, gas breakdown, laser sparks, etc.") Kudryavtsev at Fig. 1  FIG. 1. Diagram showing the relative sizes of the elect fluxes in terms of the atomic energy levels for the slow and fast (b) stages. The width of the arrows indicates t magnitude of the electron flux. The horizontal arrows the diffusion fluxes of electrons and excited atoms reac the walls of the discharge tube. Kudryavtsev at Fig. 6

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	Wang in view of Kudryavtsev

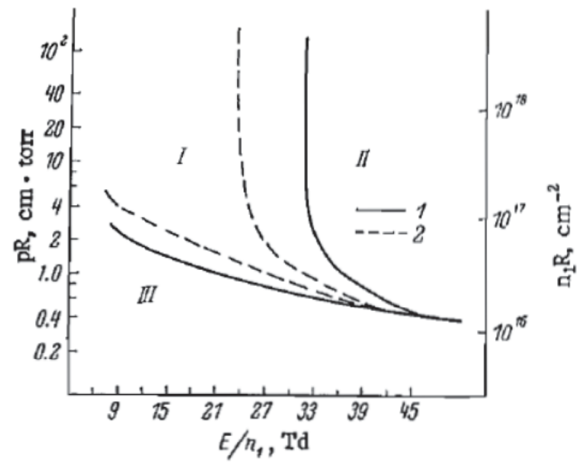


FIG. 6. The behavior of n_e in the bulk of an argon discharge. 1) $n_{e0}/n_1 = 10^{-8}$; 2) 10^{-7}. Stepwise ionization predominates in region I, direct ionization processes predominate in region II, and n_e does not increase in region III.

Kudryavtsev at 31, right col, ¶ 7 ("The behavior of the increase in n_e with time thus enables us to arbitrarily divide the ionization process into two stages, which we will call the slow and fast growth stages. Fig. 1 illustrates the relationships between the main electron currents in terms of the atomic energy levels during the slow and fast stages.").

Kudryavtsev at 31, right col, ¶ 6 ("For nearly stationary n_2 [excited atom density] values … there is an explosive increase in n_e [plasma density]. The subsequent increase in n_e then reaches its maximum value, equal to the rate of excitation [equation omitted], which is several orders of magnitude greater than the ionization rate during the initial stage.")

Kudryavtsev at Abstract ("[I]n a pulsed inert-gas discharge plasma at moderate pressures… [i]t is shown that the electron density increases explosively in time due to accumulation of atoms in the lowest excited states.")

If one of ordinary skill, applying Wang's power levels did not experience Kudryavtsev's "explosive increase" in plasma density, it would have been obvious to adjust the operating parameters, e.g., increase the pulse length and/or pressure, so as to trigger Kudryavtsev's fast stage of ionization. One of ordinary skill would have been motivated to use Kudryavtsev's fast stage of ionization in Wang so as to increase plasma density and thereby increase the sputtering rate. Further, use of Kudryavtsev's fast stage in Wang

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	Wang in view of Kudryavtsev
	would have been a combination of old elements that yielded predictable results of increasing plasma density and multi-step ionization. Kudryavtsev states, "[s]ince the effects studied in this work are characteristic of ionization whenever a field is suddenly applied to a weakly ionized gas, they must be allowed for when studying emission mechanisms in pulsed gas lasers, gas breakdown, laser sparks, etc." Kudryavtsev at 34, right col, ¶ 4 (Ex. 1004). Because Wang applies voltage pulses that "suddenly generate an electric field," one of ordinary skill reading Wang would have been motivated to consider Kudryavtsev and to use Kudryavtsev's fast stage in Wang.
2. The sputtering source of claim 1 wherein the power supply generates a constant power.	The combination of Wang and Kudryavtsev discloses the power supply generates a constant power. *See* claim 1. Wang at Figs. 1, 6, 7 Fig. 6 shows constant power for the duration of the pulse τ_W.
3. The sputtering source of claim 1 wherein the power supply generates a constant voltage.	The combination of Wang with Kudryavtsev discloses the power supply generates a constant voltage. *See* claim 1. Wang at 7:61-62 ("The pulsed DC power supply 80 produces a train of negative voltage pulses.") Wang at Fig. 7. One of ordinary skill would have understood that a constant voltage would produce pulse P_P of constant power for at least a portion of the pulse τ_W.
4. The sputtering source of claim 1 wherein the electric field comprises a quasi-static electric field.	The combination of Wang and Kudryavtsev discloses the electric field comprises a quasi-static electric field. *See* evidence cited in claim 1. '759 Patent, 7:57-60 ("By quasi-static electric field, we mean an electric field that has a characteristic time of electric field variation that is much greater than the collision time for electrons with neutral

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	**Wang in view of Kudryavtsev**
	gas particles.") Wang at 4:5-7 ("A sputter working gas such as argon is supplied from a gas source 32 through a mass flow controller 34 to a region in back of the grounded shield 24."). Wang at 7:61-62 ("pulsed DC power supply 80 produces a train of negative voltage pulses.") Wang at 5:45-48 ("[The pulse width τ_w] should be at least 50 µs.")" Fu at 1:46-48 ("Although the base pressure can be held to about 10^{-7} Torr or even lower, the pressure of the working gas is typically maintained at between about 1 and 1000 mTorr."). *Background:* Raizer at 11, §2.1.4 ("The collision frequency ν_m is proportional to…pressure *p*."). Raizer at Table 2.1 ("$\nu_m/p = 5.3 \times 10^9\ s^{-1}\ Torr^{-1}$")
5. The sputtering source of claim 1 wherein the electric field comprises a pulsed electric field.	The combination of Wang and Kudryavtsev discloses the electric field comprises a pulsed electric field. *See* evidence cited in claim 1. Wang at Figs. 6, 7 Wang at 7:61-63 ("The pulsed DC power supply 80 produces a train of negative voltage pulses…")
6. The sputtering source of claim 1 wherein the rise time of the voltage pulse is chosen to increase the ionization rate of the excited atoms in the weakly-ionized plasma.	The combination of Wang and Kudryavtsev discloses the rise time of the voltage pulse is chosen to increase the ionization rate of the excited atoms in the weakly-ionized plasma. *See* evidence cited in claim 1. Wang at 5:23-26 ("The illustrated pulse form is idealized. Its exact shape depends on the design of the pulsed DC power supply 80, and significant rise times and fall times are expected.").
7. The sputtering source of claim 1 wherein the weakly-ionized	The combination of Wang and Kudryavtsev discloses the weakly-ionized plasma reduces the probability of developing an electrical

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	**Wang in view of Kudryavtsev**
plasma reduces the probability of developing an electrical breakdown condition between the anode and the cathode assembly.	breakdown condition between the anode and the cathode assembly. *See* evidence cited in claim 1. Wang at 7:3-49 ("Plasma ignition, particularly in plasma sputter reactors, has a tendency to generate particles during the initial arcing, which may dislodge large particles from the target or chamber… The initial plasma ignition needs be performed only once and at much lower power levels so that particulates produced by arcing are much reduced.").
8. The sputtering source of claim 1 wherein the ions in the strongly-ionized plasma impact the surface of the sputtering target in a manner that causes substantially uniform erosion of the sputtering target.	The combination of Wang and Kudryavtsev discloses the ions in the strongly-ionized plasma impact the surface of the sputtering target in a manner that causes substantially uniform erosion of the sputtering target. *See* evidence cited in claim 1. Wang at 4:49-51 ("The rotation scans the HDP region 42 about the face of the target 14 to more evenly erode the target 14 and to produce a more uniform sputter coating on the wafer 20.") Wang at 7:28-30 ("Instead, the application of the high peak power P_P instead quickly causes the already existing plasma to spread and increases the density of the plasma.").
9. The sputtering source of claim 1 wherein the strongly-ionized plasma is substantially uniform proximate to the sputtering target.	The combination of Wang and Kudryavtsev discloses the strongly-ionized plasma is substantially uniform proximate to the sputtering target. *See* evidence cited in claim 1. *See* evidence cited in claim 8.
10. The sputtering source of claim 1 further comprising a substrate support that is positioned in a path of the sputtering flux.	The combination of Wang with Kudryavtsev discloses a substrate support that is positioned in a path of the sputtering flux. *See* evidence cited in claim 1. '759 Patent at 3:10-12 ("FIG. 1 shows a cross-sectional view of a

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	Wang in view of Kudryavtsev
	known magnetron sputtering apparatus 100…") '759 Patent at 3:44-46 ("substrate 134 is positioned in the vacuum chamber 104 on a substrate support 135 to receive the sputtered target material 116.") Wang at Fig. 1 Wang at 3:63-66 ("pedestal electrode 18 [that] supports a wafer 20 to be sputter coated in planar opposition to the target 14 across a processing region 22.").
12. The sputtering source of claim 10 further comprising a bias voltage power supply that applies a bias voltage to a substrate that is positioned on the substrate support.	The combination of Wang with Kudryavtsev discloses a bias voltage power supply that applies a bias voltage to a substrate that is positioned on the substrate support. *See* evidence cited in claim 10. Wang at 4:31-34 ("[A]n RF bias power supply is connected to the pedestal electrode 18 to create a negative DC self-bias on the wafer 20.")
13. The sputtering source of claim 1 wherein a volume between the anode and the cathode assembly is chosen to increase the ionization rate of the excited atoms in the weakly-ionized plasma.	The combination of Wang and Kudryavtsev discloses a volume between the anode and the cathode assembly is chosen to increase the ionization rate of the excited atoms in the weakly-ionized plasma. *See* evidence cited in claim 1. If one of ordinary skill building a system according to Wang did not experience Kudryavtsev's "explosive increase" in plasma density, it would have been obvious to adjust the operating parameters, e.g., increase the amplitude or width of Wang's pulse P_P, so as to trigger Kudryavtsev's fast stage of ionization. Such ionization would occur in the volume between Wang's anode and cathode. One of ordinary skill would have been motivated to use Kudryavtsev's fast stage of ionization in Wang so as to increase plasma density and thereby increase the sputtering rate. Further, use of Kudryavtsev's fast stage in Wang would have been a combination of old elements that yielded predictable results.
14. The sputtering source of claim 1 wherein the ionization source comprises an electrode.	The combination of Wang and Kudryavtsev discloses the ionization source comprises an electrode.

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	**Wang in view of Kudryavtsev**
	See evidence cited in claim 1. Wang at 7:57-59 ("A variable DC power supply 100 [being] connected to the target 14.").
15. The sputtering source of claim 1 wherein the ionization source comprises a DC power supply that generates an electric field proximate to the anode and the cathode assembly.	The combination of Wang and Kudryavtsev discloses the ionization source comprises a DC power supply that generates an electric field proximate to the anode and the cathode assembly. *See* evidence cited in claim 1. Wang at 7:57-59 ("A variable DC power supply 100 [being] connected to the target 14.").
19. The sputtering source of claim 1 wherein the sputtering target is formed of a material chosen from the group comprising a metallic material, a polymer material, a superconductive material, a magnetic material, a non-magnetic material, a conductive material, a non-conductive material, a composite material, a reactive material, and a refractory material.	The combination of Wang and Kudryavtsev discloses the sputtering target is formed of a material chosen from the group comprising a metallic material, a polymer material, a superconductive material, a magnetic material, a non-magnetic material, a conductive material, a non-conductive material, a composite material, a reactive material, and a refractory material. *See* evidence cited in claim 1. Wang at 5:7-11 ("the deposition rate with the torpedo magnetron 60 varies as a function of DC target power for both copper neutrals, as shown by line 74, and for copper ions, as shown by line 76.")
[20pre.] A method of generating sputtering flux, the method comprising:	The combination of Wang and Kudryavtsev discloses a method of generating sputtering flux. Wang at Title ("Pulsed sputtering with a small rotating magnetron.").
[20a.] ionizing a feed gas to generate a weakly-ionized plasma proximate to a sputtering target;	The combination of Wang and Kudryavtsev discloses ionizing a feed gas to generate a weakly-ionized plasma proximate to a sputtering target. Wang at Fig. 1 Wang at 4:5-6 ("A sputter working gas such as argon is supplied from a gas source 32…."). Wang at 4:20-21 ("… a reactive gas, for example nitrogen is supplied

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	**Wang in view of Kudryavtsev**
	to the processing space 22….”). Wang at 7:17-31 (“The background power level P_B is chosen to exceed the minimum power necessary to support a plasma... [T]he application of the high peak power P_P quickly causes the already existing plasma to spread and increases the density of the plasma.”) Wang at 7:19-25 (“Preferably, the peak power P_P is at least 10 times the background power P_B … and most preferably 1000 times to achieve the greatest effect of the invention. A background power P_B of 1 kW [causes] little if any actual sputter deposition.”) Wang at 4:23-31 (“A small rotatable magnetron 40 is thus creating a region 42 of a high-density plasma (HDP)…”)
[20b.] generating a magnetic field proximate to the weakly-ionized plasma, the magnetic field substantially trapping electrons in the weakly-ionized plasma proximate to the sputtering target; and	The combination of Wang and Kudryavtsev discloses generating a magnetic field proximate to the weakly-ionized plasma, the magnetic field substantially trapping electrons in the weakly-ionized plasma proximate to the sputtering target. ‘759 Patent at 3:10-12 (“FIG. 1 shows a cross-sectional view of a known magnetron sputtering apparatus 100…” that has a magnet 126.”) ‘759 Patent at 4:4-10 [*describing the prior art Fig. 1*] (“The electrons, which cause ionization, are generally confined by the magnetic fields produced by the magnet 126. The magnetic confinement is strongest in a confinement region 142….”) Wang at Fig. 1. Wang at 4:23-27 (“A small rotatable magnetron 40 is disposed in the back of the target 14 to create a magnetic field near the face of the target 14 which traps electrons from the plasma to increase the electron density.”)
[20c.] applying a voltage pulse to the weakly-ionized plasma, an amplitude and a rise time of the voltage pulse being chosen to increase an excitation rate of ground state atoms that are present in the weakly-ionized plasma to create a multi-step	The combination of Wang and Kudryavtsev discloses applying a voltage pulse to the weakly-ionized plasma, an amplitude and a rise time of the voltage pulse being chosen to increase an excitation rate of ground state atoms that are present in the weakly-ionized plasma to create a multi-step ionization process that generates a strongly-ionized plasma, which comprises ions that sputter target material, from the weakly-ionized plasma, the multi-step ionization process comprising exciting the ground state atoms to generate excited atoms, and then

<table>
<tr><th>Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48</th><th>Wang in view of Kudryavtsev</th></tr>
<tr><td>ionization process that generates a strongly-ionized plasma, which comprises ions that sputter target material, from the weakly-ionized plasma, the multi-step ionization process comprising exciting the ground state atoms to generate excited atoms, and then ionizing the excited atoms within the weakly-ionized plasma without forming an arc discharge.</td><td>ionizing the excited atoms within the weakly-ionized plasma without forming an arc discharge.

‘759 Patent at Fig. 5
Wang at Figs. 6, 7.

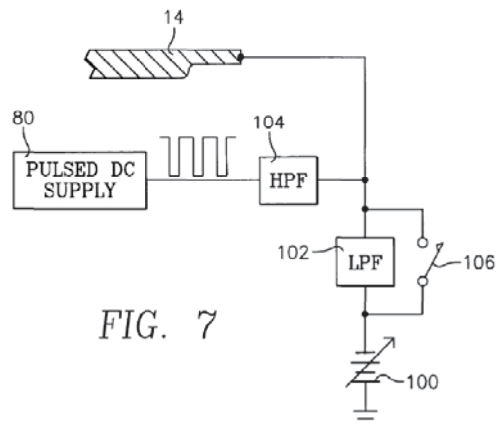


FIG. 7

Wang at 7:61-62 (“The pulsed DC power supply 80 produces a train of negative voltage pulses.”).

Wang at 5:23-27 (“[The pulse’s] exact shape depends on the design of the pulsed DC power supply 80, and significant rise times and fall times are expected.”).

Wang at 4:29-31 (“increases the sputtering rate...”).

Wang at 7:19-25 (“Preferably, the peak power level P_P is at least 10 times the background power level P_B, … most preferably 1000 times to achieve the greatest effects of the invention. A background power P_B of 1 kW will typically be sufficient…”)

Wang at 7:31-39 (“The SIP reactor is advantageous for a low-power, low-pressure background period since the small rotating SIP magnetron can maintain a plasma at a lower power and lower pressure than can a larger stationary magnetron. However, it is possible to combine highly ionized sputtering during the pulses With significant neutral sputtering during the back ground period.”).

Wang at 7:3-6 (“Plasma ignition, particularly in plasma sputter reactors, has a tendency to generate particles during the initial arcing, which may dislodge large particles from the target or chamber.”)</td></tr>
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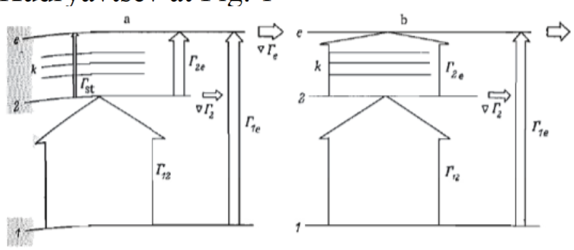
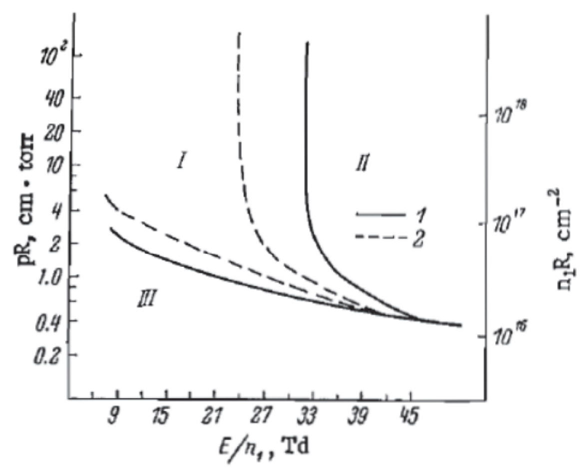
Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	Wang in view of Kudryavtsev
	Wang at 7:47-49 ("The initial plasma ignition needs be performed only once and at much lower power levels so that particulates produced by arcing are much reduced."). Wang at 7:13-28 ("Accordingly, it is advantageous to use a target power waveform illustrated in FIG. 6… As a result, once the plasma has been ignited at the beginning of sputtering prior to the illustrated waveform…"). Kudryavtsev at 34, right col, ¶ 4 ("Since the effects studied in this work are characteristic of ionization whenever a field is suddenly applied to a weakly ionized gas, they must be allowed for when studying emission mechanisms in pulsed gas lasers, gas breakdown, laser sparks, etc.") Kudryavtsev at Fig. 1  FIG. 1. Diagram showing the relative sizes of the elect fluxes in terms of the atomic energy levels for the slow and fast (b) stages. The width of the arrows indicates t magnitude of the electron flux. The horizontal arrows the diffusion fluxes of electrons and excited atoms reac the walls of the discharge tube. Kudryavtsev at Fig. 6  FIG. 6. The behavior of n_e in the bulk of an argon discharge. 1) $n_{e0}/n_1 = 10^{-8}$; 2) 10^{-7}. Stepwise ionization predominates in region I, direct ionization processes predominate in region II, and n_e does not increase in region III.

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	**Wang in view of Kudryavtsev**
	Kudryavtsev at 31, right col, ¶ 7 ("The behavior of the increase in n_e with time thus enables us to arbitrarily divide the ionization process into two stages, which we will call the slow and fast growth stages. Fig. 1 illustrates the relationships between the main electron currents in terms of the atomic energy levels during the slow and fast stages."). Kudryavtsev at 31, right col, ¶ 6 ("For nearly stationary n_2 [excited atom density] values … there is an explosive increase in n_e [plasma density]. The subsequent increase in n_e then reaches its maximum value, equal to the rate of excitation [equation omitted], which is several orders of magnitude greater than the ionization rate during the initial stage.") Kudryavtsev at Abstract ("[I]n a pulsed inert-gas discharge plasma at moderate pressures… [i]t is shown that the electron density increases explosively in time due to accumulation of atoms in the lowest excited states.") If one of ordinary skill, applying Wang's power levels did not experience Kudryavtsev's "explosive increase" in plasma density, it would have been obvious to adjust the operating parameters, e.g., increase the pulse length and/or pressure, so as to trigger Kudryavtsev's fast stage of ionization. One of ordinary skill would have been motivated to use Kudryavtsev's fast stage of ionization in Wang so as to increase plasma density and thereby increase the sputtering rate. Further, use of Kudryavtsev's fast stage in Wang would have been a combination of old elements that yielded predictable results of increasing plasma density and multi-step ionization. Kudryavtsev states, "[s]ince the effects studied in this work are characteristic of ionization whenever a field is suddenly applied to a weakly ionized gas, they must be allowed for when studying emission mechanisms in pulsed gas lasers, gas breakdown, laser sparks, etc." Kudryavtsev at 34, right col, ¶ 4 (Ex. 1004). Because Wang applies voltage pulses that "suddenly generate an electric field," one of ordinary skill reading Wang would have been motivated to consider Kudryavtsev and to use Kudryavtsev's fast stage in Wang.
21. The method of claim 20 wherein the applying the electric field comprises a applying a	The combination of Wang and Kudryavtsev discloses applying the electric field comprises a applying a quasi-static electric field.

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	Wang in view of Kudryavtsev
quasi-static electric field.	*See* evidence cited in claim 20. '759 Patent, 7:57-60 ("By quasi-static electric field, we mean an electric field that has a characteristic time of electric field variation that is much greater than the collision time for electrons with neutral gas particles.") Wang at 4:5-7 ("A sputter working gas such as argon is supplied from a gas source 32 through a mass flow controller 34 to a region in back of the grounded shield 24."). Wang at 7:61-62 ("pulsed DC power supply 80 produces a train of negative voltage pulses.") Wang at 5:45-48 ("[The pulse width τ_w] should be at least 50 μs.")" Fu at 1:46-48 ("Although the base pressure can be held to about 10^{-7} Torr or even lower, the pressure of the working gas is typically maintained at between about 1 and 1000 mTorr."). <u>*Background:*</u> Raizer at 11, §2.1.4 ("The collision frequency ν_m is proportional to…pressure *p*."). Raizer at Table 2.1 ("$\nu_m/p = 5.3 \times 10^9\ s^{-1}\ Torr^{-1}$")
22. The method of claim 20 wherein the applying the electric field comprises applying a substantially uniform electric field.	The combination of Wang and Kudryavtsev discloses applying the electric field comprises applying a substantially uniform electric field. *See* evidence cited in claim 20. Wang at Fig. 1. It would have been obvious to a person of ordinary skill in the art to modify Wang such that applying the electric field would include applying a substantially uniform electric field. For example, a person of ordinary skill could modify Wang's anode to form a parallel plate capacitor with the cathode/target electrode 14.
23. The method of claim 20 wherein the applying the electric field comprises applying an electrical pulse across the	The combination of Wang and Kudryavtsev discloses applying the electric field comprises applying an electrical pulse across the weakly-ionized plasma.

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	Wang in view of Kudryavtsev
weakly-ionized plasma.	*See* evidence cited in claim 20. Wang at Figs. 6, 7 Wang at 7:61-63 ("The pulsed DC power supply 80 produces a train of negative voltage pulses…")
24. The method of claim 23 further comprising selecting at least one of a pulse amplitude and a pulse width of the electrical pulse that increases an ionization rate of the strongly-ionized plasma.	The combination of Wang and Kudryavtsev discloses selecting at least one of a pulse amplitude and a pulse width of the electrical pulse that increases an ionization rate of the strongly-ionized plasma. *See* evidence cited in claim 23. Wang at Figs. 6, 7. Wang at 5:23-26 ("The illustrated pulse form is idealized. Its exact shape depends on the design of the pulsed DC power supply 80, and significant rise times and fall times are expected."). If one of ordinary skill building a system according to Wang did not experience Kudryavtsev's "explosive increase" in plasma density, it would have been obvious to adjust the pulse amplitude or the pulse width, e.g., increase the pulse amplitude and/or length, so as to trigger Kudryavtsev's fast stage of ionization. One of ordinary skill would have been motivated to use Kudryavtsev's fast stage of ionization in Wang so as to increase plasma density and thereby increase the sputtering rate. Further, use of Kudryavtsev's fast stage in Wang would have been a combination of old elements that yielded predictable results of increasing plasma density and multi-step ionization.
25. The method of claim 23 further comprising selecting at least one of a pulse amplitude and a pulse width of the electrical pulse that reduces a probability of developing an electrical breakdown condition proximate to the sputtering target.	The combination of Wang and Kudryavtsev discloses selecting at least one of a pulse amplitude and a pulse width of the electrical pulse that reduces a probability of developing an electrical breakdown condition proximate to the sputtering target. *See* evidence cited in claim 23. One of ordinary skill would understand that Wang would suffer from arcing if the amplitude or pulse width of Wang's peak power pulses, P_P, were too large. Because Wang's peak power pulses, P_P, do not produce arcs, Wang selected their amplitude and width, below the levels that would cause arcing.

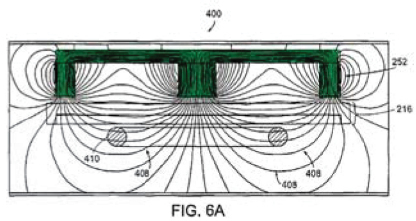
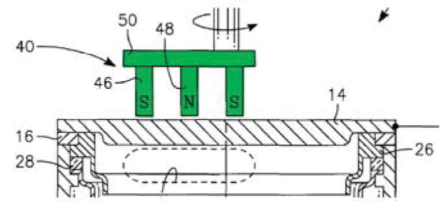
Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	**Wang in view of Kudryavtsev**
26. The method of claim 23 further comprising selecting at least one of a pulse amplitude and a pulse width of the electrical pulse that causes the strongly-ionized plasma to be substantially uniform in an area adjacent to a surface of the sputtering target.	The combination of Wang and Kudryavtsev discloses selecting at least one of a pulse amplitude and a pulse width of the electrical pulse that causes the strongly-ionized plasma to be substantially uniform in an area adjacent to a surface of the sputtering target. *See* evidence cited in claim 23. Wang at 4:49-51 ("The rotation scans the HDP region 42 about the face of the target 14 to more evenly erode the target 14 and to produce a more uniform sputter coating on the wafer 20.") Wang at 7:28-30 ("Instead, the application of the high peak power P_P instead quickly causes the already existing plasma to spread and increases the density of the plasma.")
28. The method of claim 23 wherein the electrical pulse comprises a pulse having a pulse width that is greater than 1.0 microseconds.	The combination of Wang and Kudryavtsev discloses the electrical pulse comprises a pulse having a pulse width that is greater than 1.0 microseconds. *See* evidence cited in claim 23. Wang at 5:43-46. ("The choice of pulse widths τ_w is dictated by considerations of both power supply design, radio interference, and sputtering process conditions.")
29. The method of claim 23 wherein the electrical pulse comprises a pulse train having a repetition rate that is substantially between 0.1 Hz and 1 kHz.	The combination of Wang and Kudryavtsev discloses the electrical pulse comprises a pulse train having a repetition rate that is substantially between 0.1 Hz and 1 kHz. *See* evidence cited in claim 23. Wang at 5:66-67 ("[T]hat the pulse repetition frequency is best maintained around 50 to 500 Hz.").
30. The method of claim 20 wherein the ions in the strongly-ionized plasma impact the surface of the sputtering target in a substantially uniform manner.	The combination of Wang and Kudryavtsev discloses the ions in the strongly-ionized plasma impact the surface of the sputtering target in a substantially uniform manner. *See* evidence cited in claim 20. Wang at 4:49-51 ("The rotation scans the HDP region 42 about the face of the target 14 to more evenly erode the target 14 and to produce a more uniform sputter coating on the wafer 20.")

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	Wang in view of Kudryavtsev
	Wang at 7:28-30 ("Instead, the application of the high peak power P_P instead quickly causes the already existing plasma to spread and increases the density of the plasma.")
31. The method of claim 20 wherein the strongly-ionized plasma is substantially uniform proximate to the sputtering target.	The combination of Wang and Kudryavtsev discloses the strongly-ionized plasma is substantially uniform proximate to the sputtering target. *See* evidence cited in claim 20. Wang at 4:49-51 ("The rotation scans the HDP region 42 about the face of the target 14 to more evenly erode the target 14 and to produce a more uniform sputter coating on the wafer 20.") Wang at 7:28-30 ("Instead, the application of the high peak power P_P instead quickly causes the already existing plasma to spread and increases the density of the plasma.")
34. The method of claim 20 further comprising forming a film on a surface of a substrate from the material sputtered from the sputtering target.	The combination of Wang and Kudryavtsev discloses forming a film on a surface of a substrate from the material sputtered from the sputtering target. *See* evidence cited in claim 20. '759 Patent at 3:10-12 ("FIG. 1 shows a cross-sectional view of a known magnetron sputtering apparatus 100…") '759 Patent at 3:44-46 ("substrate 134 is positioned in the vacuum chamber 104 on a substrate support 135 to receive the sputtered target material 116.") Wang at Fig. 1 Wang at 3:63-66 ("pedestal electrode 18 [that] supports a wafer 20 to be sputter coated in planar opposition to the target 14 across a processing region 22.").
36. The method of claim 34 further comprising applying a bias voltage to the film.	The combination of Wang and Kudryavtsev discloses applying a bias voltage to the film. *See* evidence cited in claim 34. Wang at 4:31-34 ("[A]n RF bias power supply is connected to the pedestal electrode 18 to create a negative DC self-bias on the wafer

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	**Wang in view of Kudryavtsev**
	20.”)
37. The method of claim 20 wherein the ionizing the feed gas comprises exposing the feed gas to an electric field.	The combination of Wang and Kudryavtsev discloses ionizing the feed gas comprises exposing the feed gas to an electric field. *See* evidence cited in claim 20. Wang at Fig. 7. Wang at 7:58-61 (“… DC power supply 100 is connected to the target 14 … and supplies an essentially constant negative voltage to the target 14 corresponding to the background power P_B.”).
[40pre.] A magnetically enhanced sputtering source comprising:	The combination of Wang and Kudryavtsev discloses a magnetically enhanced sputtering source. *See* evidence cited in limitation [1pre] of claim 1. Wang at Title (“Pulsed sputtering with a small rotating magnetron.”).
[40a.] means for ionizing a feed gas to generate a weakly-ionized plasma proximate to a sputtering target;	The combination of Wang and Kudryavtsev discloses means for ionizing a feed gas to generate a weakly-ionized plasma proximate to a sputtering target. <u>Claimed function</u> Claim 40 recites “means for ionizing a feed gas to generate a weakly-ionized plasma proximate to a sputtering target.” The combination of Wang and Kudryavtsev teach the function corresponding to the “means for ionizing…” limitation. Wang at 4:5-6 (“A sputter working gas such as argon is supplied from a gas source 32….”). Wang at 4:20-21 (“… a reactive gas, for example nitrogen is supplied to the processing space 22….”). Wang at Figs. 1, 6 and 7. Wang at 7:17-31 (“The background power level P_B is chosen to exceed the minimum power necessary to support a plasma... [T]he application of the high peak power P_P quickly causes the already existing plasma to spread and increases the density of the plasma.”)

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	**Wang in view of Kudryavtsev**
	Wang at 7:19-25 ("Preferably, the peak power P_P is at least 10 times the background power P_B … and most preferably 1000 times to achieve the greatest effect of the invention. A background power P_B of 1 kW [causes] little if any actual sputter deposition.") Wang at 4:23-31 ("A small rotatable magnetron 40 is thus creating a region 42 of a high-density plasma (HDP)…") Wang at 7:47-49 ("The initial plasma ignition needs to be performed only once and at much lower power levels so that particulates produced by arcing are much reduced."). Wang at 7:58-61 ("… DC power supply 100 is connected to the target 14 … and supplies an essentially constant negative voltage to the target 14 corresponding to the background power P_B."). <u>Corresponding structure</u> The '759 Patent discloses the following structure that corresponds to the means for ionizing: a power supply (e.g., 456), generating the voltage, current and power values shown in Fig. 5 (e.g., between $t_1 - t_2$ and $t_6 - t_7$), that is electrically coupled to an anode (e.g., 238),a cathode assembly (e.g., 216), and/or an electrode (e.g., 452, 452', 452") wherein the anode, cathode assembly, and/or electrode are arranged relative to a sputtering target as shown in Figs. 2, 3, 7, 9A-9C, 10 and 11 and as described in the text of the '759 Patent at 4:57-65, 6:53-7:8, 8:40-46, 11:39-12:6, 12:39-46, 15:7-15, 15:35-44, 17:19-18:15, 18:35-49, and 18:58-19:30 The combination of Wang and Kudryavstev discloses the structure corresponding to the "means for ionizing…" limitation. For example: '759 Patent at Fig. 5 Wang at Fig. 7 Wang at 7:58-61 ("… DC power supply 100 is connected to the target 14 … and supplies an essentially constant negative voltage to the target 14 corresponding to the background power P_B.")

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	Wang in view of Kudryavtsev
	Wang at 7:22-23 ("A background power P_B of 1 kW will typically be sufficient to support a plasma…") The only difference between claim 40's "means for ionizing…" and Wang is that Wang's cathode/target 14 and anode 24 are not arranged in the same mechanical configuration shown in the '759 patent. However, the difference between Wang's and the '759 patent's mechanical arrangement of the anode and cathode is nothing more than the mechanical rearrangement of well-known components. Rearranging Wang's components to match that of the '759 patent would be obvious to one of ordinary skill.
[40b.] means for generating a magnetic field proximate to the weakly-ionized plasma, the magnetic field substantially trapping electrons in the weakly-ionized plasma proximate to the sputtering target; and	The combination of Wang and Kudryavtsev discloses means for generating a magnetic field proximate to the weakly-ionized plasma, the magnetic field substantially trapping electrons in the weakly-ionized plasma proximate to the sputtering target. <u>Claimed function</u> Claim 40 recites "means for generating a magnetic field proximate to the weakly-ionized plasma, the magnetic field substantially trapping electrons in the weakly-ionized plasma proximate to the sputtering target." The combination of Wang and Kudryavtsev teach the function corresponding to the "means for generating…" limitation. '759 Patent at 3:10-12 ("FIG. 1 shows a cross-sectional view of a known magnetron sputtering apparatus 100…" that has a magnet 126.) '759 Patent at 4:4-10 ("The electrons, which cause ionization, are generally confined by the magnetic fields produced by the magnet 126. The magnetic confinement is strongest in a confinement region 142….") Wang at Fig. 1. Wang at 4:23-27 ("A small rotatable magnetron 40 is disposed in the back of the target 14 to create a magnetic field near the face of the target 14 which traps electrons from the plasma to increase the electron density.") <u>Corresponding structure</u>

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	Wang in view of Kudryavtsev
	The '759 Patent discloses the following structure that corresponds to the "means for generating…" magnet assembly 252 arranged as shown in Figs. 2, 3, 6A-6D, 7, 10 and 11 and as described in the text of the '759 Patent at 5:58-6:21, 8:46-50, 12:62-14:65, and 15:29-33   **Annotated Fig. 6A of '759 Patent** **Annotated Fig. 1 of Wang** The only difference between Wang's Fig. 1 magnetron and claim 40's "means for generating a magnetic field …" is that the '759 patent's magnet is stationary whereas Wang's magnetron rotates. However, the substitution of a stationary magnetron for a rotating magnetron is no more than an obvious substitution of well-known components.
[40c.] means for applying a voltage pulse to the weakly-ionized plasma, an amplitude and a rise time of the voltage pulse being chosen to increase an excitation rate of ground state atoms that are present in the weakly-ionized plasma to create a multi-step ionization process that generates a strongly-ionized plasma from the weakly-ionized plasma, the multi-step ionization process comprising exciting the ground state atoms to generate excited atoms, and then ionizing the excited atoms within the weakly-ionized plasma, without forming an arc discharge, to ions that sputter target material from	The combination of Wang and Kudryavtsev discloses means for applying a voltage pulse to the weakly-ionized plasma, an amplitude and a rise time of the voltage pulse being chosen to increase an excitation rate of ground state atoms that are present in the weakly-ionized plasma to create a multi-step ionization process that generates a strongly-ionized plasma from the weakly-ionized plasma, the multi-step ionization process comprising exciting the ground state atoms to generate excited atoms, and then ionizing the excited atoms within the weakly-ionized plasma, without forming an arc discharge, to ions that sputter target material from the sputtering target. <u>Claimed function</u> Claim 40 recites "means for applying a voltage pulse to the weakly-ionized plasma, an amplitude and a rise time of the voltage pulse being chosen to increase an excitation rate of ground state atoms that are present in the weakly-ionized plasma to create a multi-step ionization process that generates a strongly-ionized plasma from the weakly-ionized plasma, the multi-step ionization process comprising exciting the ground state atoms to generate excited atoms, and then

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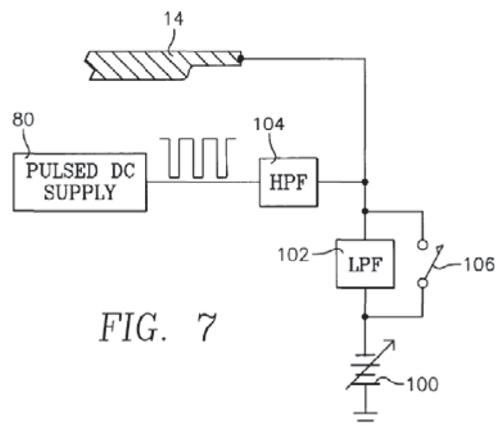
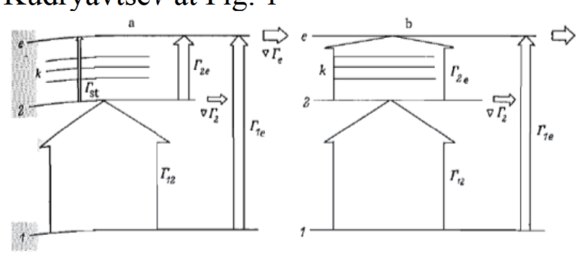
Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	Wang in view of Kudryavtsev
the sputtering target.	ionizing the excited atoms within the weakly-ionized plasma, without forming an arc discharge, to ions that sputter target material from the sputtering target." The combination of Wang and Kudryavtsev teach the function corresponding to the "means for applying…" limitation. '759 Patent at Fig. 5 Wang at Figs. 6, 7.  FIG. 7 Wang at 7:61-62 ("The pulsed DC power supply 80 produces a train of negative voltage pulses."). Wang at 5:23-27 ("[The pulse's] exact shape depends on the design of the pulsed DC power supply 80, and significant rise times and fall times are expected."). Wang at 4:29-31 ("increases the sputtering rate..."). Wang at 7:19-25 ("Preferably, the peak power level P_P is at least 10 times the background power level P_B, … most preferably 1000 times to achieve the greatest effects of the invention. A background power P_B of 1 kW will typically be sufficient…") Wang at 7:31-39 ("The SIP reactor is advantageous for a low-power, low-pressure background period since the small rotating SIP magnetron can maintain a plasma at a lower power and lower pressure than can a larger stationary magnetron. However, it is possible to combine highly ionized sputtering during the pulses With significant neutral sputtering during the back ground period.").

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	Wang in view of Kudryavtsev
	Wang at 7:3-6 ("Plasma ignition, particularly in plasma sputter reactors, has a tendency to generate particles during the initial arcing, which may dislodge large particles from the target or chamber.") Wang at 7:47-49 ("The initial plasma ignition needs be performed only once and at much lower power levels so that particulates produced by arcing are much reduced."). Wang at 7:13-28 ("Accordingly, it is advantageous to use a target power waveform illustrated in FIG. 6… As a result, once the plasma has been ignited at the beginning of sputtering prior to the illustrated waveform…"). Kudryavtsev at 34, right col, ¶ 4 ("Since the effects studied in this work are characteristic of ionization whenever a field is suddenly applied to a weakly ionized gas, they must be allowed for when studying emission mechanisms in pulsed gas lasers, gas breakdown, laser sparks, etc.") Kudryavtsev at Fig. 1  FIG. 1. Diagram showing the relative sizes of the elect fluxes in terms of the atomic energy levels for the slow and fast (b) stages. The width of the arrows indicates t magnitude of the electron flux. The horizontal arrows the diffusion fluxes of electrons and excited atoms reac the walls of the discharge tube. Kudryavtsev at Fig. 6

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Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	Wang in view of Kudryavtsev

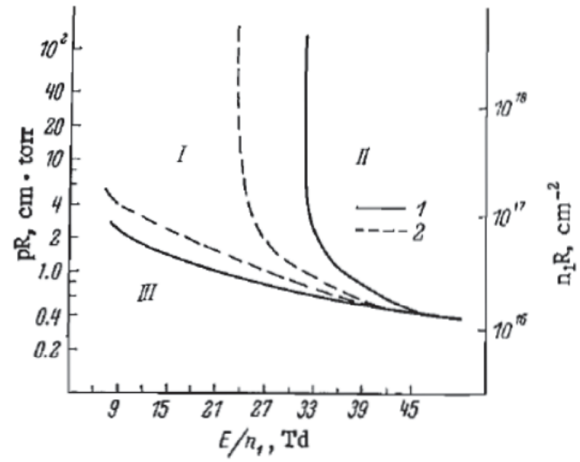

FIG. 6. The behavior of n_e in the bulk of an argon discharge. 1) n_{e0}/n_1 = 10^{-8}; 2) 10^{-7}. Stepwise ionization predominates in region I, direct ionization processes predominate in region II, and n_e does not increase in region III.

Kudryavtsev at 31, right col, ¶ 7 ("The behavior of the increase in n_e with time thus enables us to arbitrarily divide the ionization process into two stages, which we will call the slow and fast growth stages. Fig. 1 illustrates the relationships between the main electron currents in terms of the atomic energy levels during the slow and fast stages.").

Kudryavtsev at 31, right col, ¶ 6 ("For nearly stationary n_2 [excited atom density] values … there is an explosive increase in n_e [plasma density]. The subsequent increase in n_e then reaches its maximum value, equal to the rate of excitation [equation omitted], which is several orders of magnitude greater than the ionization rate during the initial stage.")

Kudryavtsev at Abstract ("[I]n a pulsed inert-gas discharge plasma at moderate pressures… [i]t is shown that the electron density increases explosively in time due to accumulation of atoms in the lowest excited states.").

If one of ordinary skill, applying Wang's power levels did not experience Kudryavtsev's "explosive increase" in plasma density, it would have been obvious to adjust the operating parameters, e.g., increase the pulse length and/or pressure, so as to trigger Kudryavtsev's fast stage of ionization. One of ordinary skill would have been motivated to use Kudryavtsev's fast stage of ionization in Wang so as to increase plasma density and thereby increase the

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	**Wang in view of Kudryavtsev**
	sputtering rate. Further, use of Kudryavtsev's fast stage in Wang would have been a combination of old elements that yielded predictable results of increasing plasma density and multi-step ionization. Kudryavtsev states, "[s]ince the effects studied in this work are characteristic of ionization whenever a field is suddenly applied to a weakly ionized gas, they must be allowed for when studying emission mechanisms in pulsed gas lasers, gas breakdown, laser sparks, etc." Kudryavtsev at 34, right col, ¶ 4 (Ex. 1004). Because Wang applies voltage pulses that "suddenly generate an electric field," one of ordinary skill reading Wang would have been motivated to consider Kudryavtsev and to use Kudryavtsev's fast stage in Wang. <u>Corresponding structure</u> The '759 Patent discloses the following structure that corresponds to the "means for applying…" a pulsed DC power supply (e.g., 234), generating the voltage, current and power values shown in Fig. 5 (e.g., between $t_2 - t_4$), electrically coupled to an anode (e.g., 238) and cathode assembly (e.g., 216), wherein the anode and cathode assembly are arranged as shown in Figs. 2, 3, 7, 10, and 11 and as described in the text of the '759 Patent at 5:6-49, 8:51-10:6, 12:7-38, 12:47-54, 15:54-16:12 and 19:31-38 The combination of Wang and Kudryavstev discloses the structure corresponding to the "means for applying…" limitation. For example: Wang at Figs. 1, 7. Wang at 7:61-62 ("The pulsed DC power supply 80 produces a train of negative voltage pulses.") Any difference between Wang's and the '759 Patent's mechanical arrangement of the anode and cathode is nothing more than the mechanical rearrangement of well-known components. Rearranging Wang's components to match that of the '759 Patent would be obvious to one of ordinary skill.
41. The sputtering source of claim 1 wherein the cathode assembly and the anode are	The combination of Wang and Kudryavtsev discloses the cathode assembly and the anode are positioned so as to form a gap there between.

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	**Wang in view of Kudryavtsev**
positioned so as to form a gap there between.	*See* evidence cited in claim 1. It would have been obvious to either add a separate anode electrode in Wang's chamber between the cathode and the grounded shield 24 and to position the separate anode electrode adjacent to the cathode or to move the grounded shield 24 so as to form the gap shown in the '759 Patent, and therefore, to define a small gap between the anode and the cathode. Doing so would involve nothing more than adding or rearranging well-known components, which is within the skill of the ordinary practitioner.
42. The sputtering source of claim 1 wherein the weakly-ionized plasma is generated from a feed gas that comprises the ground state atoms.	The combination of Wang and Kudryavtsev discloses the weakly-ionized plasma is generated from a feed gas that comprises the ground state atoms. *See* evidence cited in claim 1. Wang at 4:5-7 ("A sputter working gas such as argon is supplied from a gas source 32 through a mass flow controller to a region in back of the grounded shield 24.")
43. The sputtering source of claim 1 wherein the excited atoms within the weakly-ionized plasma are ionized by electrons to create the ions that sputter material from the sputtering target.	The combination of Wang and Kudryavtsev discloses the excited atoms within the weakly-ionized plasma are ionized by electrons to create the ions that sputter material from the sputtering target. *See* evidence cited in claim 1. '759 Patent at 1:32-35 ("The plasma is replenished by electron-ion pairs formed by the collision of neutral molecules with secondary electrons generated at the target surface.") Kudryavtsev at Equation (1): $\frac{\partial n_e}{\partial t} = n_1 n_e \beta_{1e} + n_2 n_e \beta_{2e} + n_2 n_e \beta_{st} - \nabla \Gamma_e,$ Kudryavtsev at 30, right col, last ¶ ("…n_2, and n_e are the atomic densities in the …first excited states and the electron density, respectively;… β_{2e} [is] the rate coefficient[]…").
46. The method of claim 20 wherein the weakly-ionized plasma is generated from a feed gas that comprises the ground	The combination of Wang and Kudryavtsev discloses the weakly-ionized _plasma is generated from a feed gas that comprises the ground state atoms.

Claims 1-10, 12-15, 19-26, 28-31, 34, 36, 37, 40-43 and 46-48	**Wang in view of Kudryavtsev**
state atoms.	*See* evidence cited in claim 20. *See* evidence cited in claim 42. Wang at 4:5-7 ("A sputter working gas such as argon is supplied from a gas source 32 through a mass flow controller to a region in back of the grounded shield 24.")
47. The method of claim 20 wherein a duration of the weakly-ionized plasma is approximately between one microsecond and one hundred seconds.	The combination of Wang and Kudryavtsev discloses a duration of the weakly-ionized plasma is approximately between one microsecond and one hundred seconds. *See* evidence cited in claim 20. Wang at 5:43-46 ("The choice of pulse width τ_w is dictated … Typically, it should be at least 50 µs."). Wang at Fig. 6 [identifying τ_w as the width of the peak power pulse]. Wang at 5:55-56 ("Ratio of the pulse width to the repetition period τ_w / τ_p is preferably less than 10% and more preferably less than 1%....").
48. The method of claim 20 wherein the ionizing the excited atoms within the weakly-ionized plasma to create ions that sputter material from the sputtering target comprises ionizing the excited atoms with electrons.	The combination of Wang and Kudryavtsev discloses ionizing the excited atoms within the weakly-ionized plasma to create ions that sputter material from the sputtering target comprises ionizing the excited atoms with electrons. *See* evidence cited in claim 20. *See* evidence cited in claim 43.