EXHIBIT C.15
U.S. Patent No. 7,811,421

References cited herein:

- U.S. Pat. No. 7,811,421 ("'421 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")
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'421 Claims 9, 21, and 35	Wang in view of Kudryavtsev
[1pre]. A sputtering source comprising:	Wang discloses a sputtering source. Wang at Title ("pulsed sputtering with a small rotating magnetron")
[1a] a) a cathode assembly comprising a sputtering target that is positioned adjacent to an anode; and	Wang discloses a cathode assembly comprising a sputtering target that is positioned adjacent to an anode. '421 Patent at 3:39-4:2 ("FIG. 1 illustrates a cross-sectional view of a known magnetron sputtering apparatus 100 having a pulsed power source 102. … The magnetron sputtering apparatus 100 also includes a cathode assembly 114 having a target 116. … An anode 130 is positioned in the vacuum chamber 104 proximate to the cathode assembly 114.") Wang at 3:66-4:1 ("A grounded shield 24 … acts as a grounded anode for the cathode of the negatively biased target 14.")
[1b] b) a power supply that generates a voltage pulse between the anode and the cathode assembly that creates a weakly-ionized plasma and then a strongly-ionized plasma from the weakly-ionized plasma without an occurrence of arcing between the anode and the cathode assembly, an amplitude, a duration and a rise time of the voltage pulse being chosen to increase a density of ions in the strongly-ionized plasma.	Wang discloses a power supply that generates a voltage pulse between the anode and the cathode assembly that creates a weakly-ionized plasma and then a strongly-ionized plasma from the weakly-ionized plasma without an occurrence of arcing between the anode and the cathode assembly, an amplitude, a duration and a rise time of the voltage pulse being chosen to increase a density of ions in the strongly-ionized plasma Wang at Figs. 1, 6 and 7 Wang at 7:58-61 ("… DC power supply 100 is connected to the target 14 … and supplies an

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	essentially constant negative voltage to the target 14 corresponding to the background power P_B.") Wang at 7:61-62 ("The pulsed DC power supply 80 produces a train of negative voltage pulses.") Wang at 3:66-4:1 ("A g***rounded shield 24*** … acts as a ***grounded anode*** for the cathode of the negatively biased target 14.") (emphasis added) 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 7:31-39 ("In one mode of operating the reactor, during the background period, little or no target sputtering is expected. The SIP reactor is advantageous for a low-power, low-pressure background period since the small rotating SIP magnetron can maintain a plasma at 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 background 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 7:13-28 ("Accordingly, it is advantageous to use a target power waveform illustrated in FIG. 6… As a result, once the plasma has been ignited at

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	the beginning of sputtering prior to the illustrated waveform…") 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 7:28-30 ("…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") 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.")
9. The sputtering source of claim 1 wherein the voltage pulse generated between the anode and the cathode assembly excites atoms in the weakly-ionized plasma and generates secondary electrons from the cathode assembly, the secondary electrons ionizing a portion of the excited atoms, thereby creating the strongly-ionized plasma.	The combination of Wang and Kudryavtsev discloses the voltage pulse generated between the anode and the cathode assembly excites atoms in the weakly-ionized plasma and generates secondary electrons from the cathode assembly, the secondary electrons ionizing a portion of the excited atoms, thereby creating the strongly-ionized plasma. *See* evidence cited in claim 1 '421 Patent at Fig. 6 '421 Patent at 15:56-61 ("Between time t1 and time t2, … the power 330 remain[s] constant as the weakly-ionized plasma 262 (FIG. 5B) is generated. … The power 336 delivered at time t2 is in the range of 0.01 kW to 100 kW.") '421 Patent at 16:32-34 ("In one embodiment, at time t5, … the power 350 is in the range of 1 kW to 10 MW.") '421 Patent at 8:25-26 ("In one embodiment, the pressure in the chamber varies from about 10^{-3} to 10 Torr.") '421 Patent at 1:44-46 ("Magnetron sputtering

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	systems use magnetic fields that are shaped to trap and to concentrate secondary electrons, which are produced by ion bombardment of the target surface.") 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 7:32-36 ("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.") Wang at 7:36-39 ("However, it is possible to combine highly ionized sputtering during the pulses with significant neutral sputtering during the background period.") Fu [incorporated by referenced in Wang] 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.") Kudryavtsev at 34, right col, ¶ 4 ("[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 Figs. 1 and 6 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

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	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 ("in 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.") Kudryavtsev at 30, Equation 1 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[]…") It would have been obvious to combine Wang and Kudryavtsev, which 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. Because Wang applies pulses that "suddenly generate an electric field," one of ordinary skill reading Wang would have been motivated to consider Kudryavtsev to better understand the effects of applying Wang's pulse.
[17pre]. A sputtering source comprising:	Wang discloses a sputtering source. *See* evidence cited in claim 1 preamble
[17a] a) a cathode assembly comprising a sputtering target that is positioned adjacent to an anode;	Wang discloses a cathode assembly comprising a sputtering target that is positioned adjacent to an anode. *See* evidence cited in claim [1a]
[17b] b) a power supply that generates	Wang discloses a power supply that generates a

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