

**EXHIBIT C.09**  
**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”)

| ‘421 Claims 1, 2, 8, 10-13, 16, 17, 22-25, 28-30, 33, 34, 39, 42, 43 and 46-48   | Wang  |
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| [1pre]. A sputtering source comprising:  | Wang discloses a sputtering source.<br><br>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.<br><br>‘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.”)<br><br>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<br><br>Wang at Figs. 1, 6 and 7<br><br>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 <sub>B</sub> .”) |

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| <b>‘421 Claims 1, 2, 8, 10-13, 16, 17, 22-25, 28-30, 33, 34, 39, 42, 43 and 46-48</b> | <b>Wang</b>   |
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|   | <p>Wang at 7:61-62 (“The pulsed DC power supply 80 produces a train of negative voltage pulses.”)</p> <p>Wang at 3:66-4:1 (“A grounded shield 24 ... acts as a grounded anode for the cathode of the negatively biased target 14.”)</p> <p>Wang at 7:17-31 (“The background power level <math>P_B</math> is chosen to exceed the minimum power necessary to support a plasma... [T]he application of the high peak power <math>P_P</math> quickly causes the already existing plasma to spread and increases the density of the plasma.”)</p> <p>Wang at 7:19-25 (“Preferably, the peak power <math>P_P</math> is at least 10 times the background power <math>P_B</math> ... and most preferably 1000 times to achieve the greatest effect of the invention. A background power <math>P_B</math> of 1 kW [causes] little if any actual sputter deposition.”)</p> <p>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.”)</p> <p>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.”)</p> <p>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</p> |

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| ‘421 Claims 1, 2, 8, 10-13, 16, 17, 22-25, 28-30, 33, 34, 39, 42, 43 and 46-48   | Wang  |
|--|---|
|  | <p>sputtering prior to the illustrated waveform...”)</p> <p>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.”)</p> <p>Wang at 7:28-30 (“...the application of the high peak power <math>P_p</math> instead quickly causes the already existing plasma to spread and increases the density of the plasma”)</p> <p>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.”)</p>  |
| <p>2. The sputtering source of claim 1 wherein the strongly ionized plasma at least partially converts neutral sputtered atoms into positive ions in order to enhance the sputtering process with ionized physical vapor deposition.</p>                     | <p>Wang discloses the strongly ionized plasma at least partially converts neutral sputtered atoms into positive ions in order to enhance the sputtering process with ionized physical vapor deposition.</p> <p>Wang at 1:5-7 (“invention relates to sputtering apparatus and a method capable of producing a high fraction of ionized sputter particles.”)</p> <p>Wang at 1:34-37(“[a]s a result of the high-density plasma, a large fraction of the sputtered metal atoms passing through the argon plasma are ionized and thus can be electrically attracted to the biased wafer support.”)</p> <p>Wang at 2:33-36 (“Particularly at the high ionization fraction, the ionized sputtered metal atoms are attracted back to the targets and sputter yet further metal atoms.”)</p> |
| <p>8. The sputtering source of claim 1 further comprising 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</p> | <p>Wang 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.</p>   |

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| the sputtering target.   | <p><i>See</i> evidence cited in claim 1</p> <p>‘421 Patent at 3:39-63 (FIG. 1 illustrates a cross-sectional view of a known magnetron sputtering apparatus 100 having a pulsed power source 102....The magnet 126 shown in FIG. 1...)</p> <p>‘421 Patent at 4:31-34 [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....”)</p> <p>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.”)</p> <p>Wang at Fig. 1</p> |
| 10. The sputtering source of claim 1 wherein the power supply generates a constant power.  | <p>Wang discloses the power supply generates a constant power.</p> <p><i>See</i> evidence cited in claim 1</p> <p>Wang at Figs. 1, 6, and 7</p>   |
| 11. The sputtering source of claim 1 wherein the power supply generates a constant voltage.  | <p>Wang discloses the power supply generates a constant voltage.</p> <p><i>See</i> evidence cited in claim 1</p> <p>Wang at 7:61-62 (“pulsed DC power supply 80 produces a train of negative voltage pulses.”)</p>  |
| 12. The sputtering source of claim 1 wherein a rise time of the voltage pulse is chosen to increase an ionization rate of the strongly-ionized plasma. | <p>Wang discloses a rise time of the voltage pulse is chosen to increase an ionization rate of the strongly-ionized plasma.</p> <p><i>See</i> evidence cited in claim 1</p>   |
| 13. The sputtering source of claim 1 wherein a distance between the anode and  | <p>Wang discloses a distance between the anode and the cathode assembly is chosen to increase an</p>  |

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|---|--|
| the cathode assembly is chosen to increase an ionization rate of strongly-ionized plasma.   | ionization rate of strongly-ionized plasma.<br><br><i>See</i> evidence cited in claim 1  |
| 16. The sputtering source of claim 1 wherein a pulse width of the voltage pulse is in the range of approximately 0.1 $\mu$ sec to 100 sec.  | Wang discloses a pulse width of the voltage pulse is in the range of approximately 0.1 $\mu$ sec to 100 sec.<br><br><i>See</i> evidence cited in claim 1<br><br>Wang at 5:43-49 (“The choice of pulse widths $\tau_w$ is dictated by considerations of both power supply design, radio interference, and sputtering process conditions. Typically, it should be at least 50 $\mu$ s in this embodiment. Its upper limit is dictated mostly by the pulse repetition period $\tau_p$ , but it is anticipated that for most applications it will be less than 1 ms, and typically less than 200 $\mu$ s is for achieving the greatest effect.”) |
| [17pre]. A sputtering source comprising:  | Wang discloses a sputtering source.<br><br><i>See</i> 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.<br><br><i>See</i> evidence cited in claim [1a]   |
| [17b] 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 and a rise time of the voltage pulse being chosen to increase a density of ions in the strongly-ionized plasma; and | 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 and a rise time of the voltage pulse being chosen to increase a density of ions in the strongly-ionized plasma.<br><br><i>See</i> evidence cited in claim [1b]   |
| [17c] c) a substrate support that is positioned adjacent to the sputtering  | Wang discloses a substrate support that is positioned adjacent to the sputtering target.   |

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