EXHIBIT D.06
U.S. Patent No. 6,853,142

References cited herein:

- U.S. Pat. No. 6,853,142 ("'142 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")

'142 Claims 21, 22, 23, 25-30, 31, 33-39, 41, and 43	**Wang in view of Kudryavtsev**
[21pre.] An apparatus for generating a strongly-ionized plasma, the apparatus comprising:	The combination of Wang and Kudryavstev discloses an apparatus for generating a strongly-ionized plasma. Wang at Fig. 1 Wang at 7:19-25 ("Preferably, the peak power P_P is at least 10 times the background power P_B, more preferably at least 100 times, and most preferably 1000 times to achieve the greatest effect of the invention. A background power P_B of 1kW will typically be sufficient to support a plasma with the torpedo magnetron and a 200 mm wafer although with little if any actual sputter deposition.") 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 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.")
[21a.] an anode;	The combination of Wang and Kudryavstev discloses an anode. '142 Patent at 2:21-22 ("FIG. 1 illustrates a cross-sectional view of a known plasma generating apparatus

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	100…") '142 Patent at 2:45-46 ("An anode 130 is positioned in the vacuum chamber 104 proximate to the cathode 114.") 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."). (emphasis added)
[21b.] a cathode that is positioned adjacent to the anode and forming a gap there between;	The combination of Wang and Kudryavstev discloses a cathode that is positioned adjacent to the anode and forming a gap there between. '142 Patent at 2:21-22 ("FIG. 1 illustrates a cross-sectional view of a known plasma generating apparatus 100…") '142 Patent at 2:45-46 ("An anode 130 is positioned in the vacuum chamber 104 proximate to the cathode 114.") 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***."). (emphasis added) Wang at 3:63-65 ("A pedestal electrode 18 supports a wafer 20 to be sputter coated in planer opposition to the target 14 across a processing region 22.")
[21c.] an ionization source that generates a weakly-ionized plasma proximate to the cathode, the weakly-ionized plasma reducing the probability of developing an electrical breakdown condition between the anode and the cathode;	The combination of Wang and Kudryavstev discloses an ionization source that generates a weakly-ionized plasma proximate to the cathode, the weakly-ionized plasma reducing the probability of developing an electrical breakdown condition between the anode and the cathode. Wang at Fig. 7

‘142 Claims 21, 22, 23, 25-30, 31, 33-39, 41, and 43	Wang in view of Kudryavtsev
and	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 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 (Ex. 1005) (“…<u>thus creating a region 42 of a high-density plasma (HDP)</u>…”) 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.”) Wang at 7:25-28 (“As a result, once the plasma has been ignited at the beginning of sputtering prior to the illustrated waveform, no more plasma ignition occurs.”). 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.”) Wang at 7:22-23 (“A background power P_B of 1 kW will typically be sufficient to support a plasma…”)
[21d.] a power supply that produces an electric field across the gap, the	The combination of Wang and Kudryavstev discloses a power supply that produces an electric field across the

'142 Claims 21, 22, 23, 25-30, 31, 33-39, 41, and 43	Wang in view of Kudryavtsev
electric field generating excited atoms in the weakly-ionized plasma and generating secondary electrons from the cathode, the secondary electrons ionizing the excited atoms, thereby creating the strongly-ionized plasma.	gap, the electric field generating excited atoms in the weakly-ionized plasma and generating secondary electrons from the cathode, the secondary electrons ionizing the excited atoms, thereby creating the strongly-ionized plasma. '142 Patent at 1:41-43 ("Magnetron sputtering systems use magnetic fields that are shaped to trap and to concentrate secondary electrons, which are produced by ion bombardment of the target surface.") '142 Patent at 1:37-40 ("The plasma is replenished by electron-ion pairs formed by the collision of neutral molecules with secondary electrons generated at the target surface.") Wang at Fig. 7 Wang at 7:61-62 ("The pulsed DC power supply 80 produces a train of negative voltage pulses.") 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 7:36-39 ("However, it is possible to combine highly ionized sputtering during the pulses with significant neutral sputtering during the background period.") Kudryavtsev at Figs. 1, 6 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 31, right col, ¶ 6 ("For nearly stationary n_2 [excited atom density] values … there is an explosive

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	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 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[]….") *See* evidence cited in [21pre] of claim 21. 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. 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

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