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Modulated Pulse Power Deposition of Aluminum Oxide and Aluminum Nitride Films.

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Modulated pulse power (MPP) sputtering is a versatile high power pulse magnetron sputtering technique. In this technique usually a negative high voltage pulse has low and high values in order to generate low power and high power magnetron discharge within the same pulse. The presence of low power discharge prior to high power discharge and controllable voltage rise time reduce the probability to generate arc discharge in the beginning of high power magnetron discharge. Another important feature of MPP is existence of low frequency voltage modulations in the range of (15-60) kHz within the voltage pulse. Aluminum oxide and aluminum nitride films were deposited in reactive atmosphere with MPP approach. Two different high power pulse plasma generators were used. First high power pulse plasma generator produced negative voltage pulses with voltage modulation amplitude in the range of 20 -30 % of the peak voltage. Second high power pulse plasma generator produced voltage pulses with voltage modulations amplitude in the range of 100 % of the peak voltage. It was found that only when voltage modulations amplitude was close to 100 % arc free high power pulse reactive discharge can be formed. The reactive sputtering processes were performed with two different magnetrons 10 cm and 15 cm diameters. The deposition rate, film structure, orientation, and mechanical properties were analyzed and measured, and the results of the film property measurements will be presented.

Keywords
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