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# Plasma Immersion Processing: The use of pulsed bias for the control of stress and other film properties

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**Plasma Immersion Processing: The use of pulsed bias for the control of stress and other film properties**

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Plasma Immersion Deposition is a film deposition technique that has evolved at the low-energy end of the spectrum of plasma immersion techniques [1], which were originally intended as an alternative ion implantation method. One may also consider plasma immersion deposition as ion plating with pulsed biasing. Pulsed biasing has a number of advantages including the wide range of pulse duration, duty cycle, and voltage. Pulsed bias in conjunction with strongly or even fully ionized plasmas is a very powerful "knob" that can be tuned to control film properties such as stress. Films produced with thermal energies are usually under tensile stress (deposition by evaporation) while ion assisted deposition (ionized or pulsed sputtering, ion-beam assisted deposition, filtered cathodic arc deposition, laser ablation) leads to films exhibiting compressive stress. The amount of compressive stress has a maximum, and stress can be relieved using plasma immersion processing at high voltage and low duty cycle. The principles will be explained and examples will be shown.
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[1] A. Anders (Editor), *Handbook of Plasma Immersion Ion Implantation and Deposition*, Wiley, New York, 2000.