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The role of energetic ions at the substrate in Thin Film plasma processing

A. Rawat, C. Linnane, T. Gilmore
Impedans Ltd, Dublin (IE)

Abstract content

This work demonstrates the role of energetic ions in plasmas and how they affect the properties of materials deposited in thin-film plasma processing. The scope of this contribution is limited to discuss the ability to quantify the flux, energy of ions and ion-neutral fraction to optimize industrial plasma-assisted processes. For this purpose, ion energy and ion flux measurements were carried out using fully automated advanced Retarding Field Energy Analyzers (RFEA's) by Impedans Ltd [1, 2]. The *Semion Multi Sensor RFEA* measures the uniformity of ion energies and ion flux hitting a surface, negative ions, and bias voltage at any position inside a plasma chamber using an array of integrated sensors. A novel RFEA, known as the *Quantum system*, combines energy retarding grids with an integrated quartz crystal microbalance (QCM). This allows measurements of the ion energy and flux properties as well as the ion-neutral ratio and deposition rate.
A review of thin-film applications, particularly focusing on plasma-assisted Atomic Layer Deposition (ALD) and Atomic Layer Etching (ALE) processes is presented in detail [3-5]. Some of the major contributions include discussion on the impact of substrate biasing on the ion energy distribution (IED), impact of ion impingement on the chemical and microstructural properties of thin-films, tailored voltage waveforms as a technique to control the ion bombardment energy as well as for precise ion energy control. Further reported are the excellent agreements between the simulated and experimentally observed IEDs at an rf-biased electrode in a helicon plasma system, which surely gains the confidence of thin-film industries in these plasma diagnostic tools [6].

References

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