Semion used in Sputtering Applications

Measure the Ion Flux and Ion Energy incident on your substrate

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Impedans
PLASMA MEASUREMENT

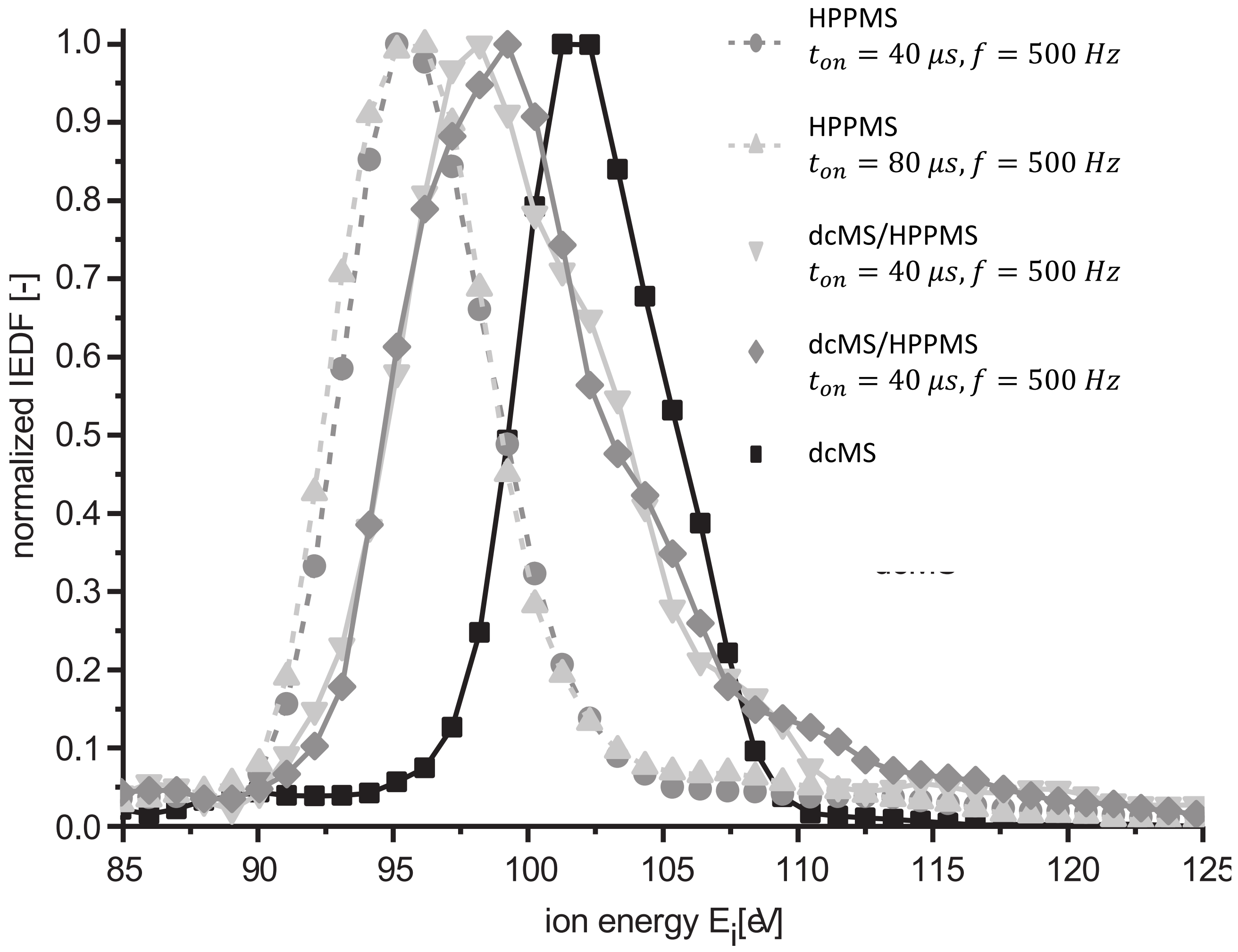
Measurement of the IEDF in a HPPMs/dcMS system

Influence of dcMS and HPPMS in a dcMS/HPPMS hybrid process on plasma and coating properties

Bobzin K et al, Surface Engineering Institute, RWTH Aachen University, Germany

DOI: [10.1016/j.tsf.2016.07.079](10.1016/j.tsf.2016.07.079)

The objective of this paper was investigate the influence of different magnetron sputtering sources with various pulse parameters on plasma and coating properties.



Examples of the IEDF for dcMS and/or HiPIMS.

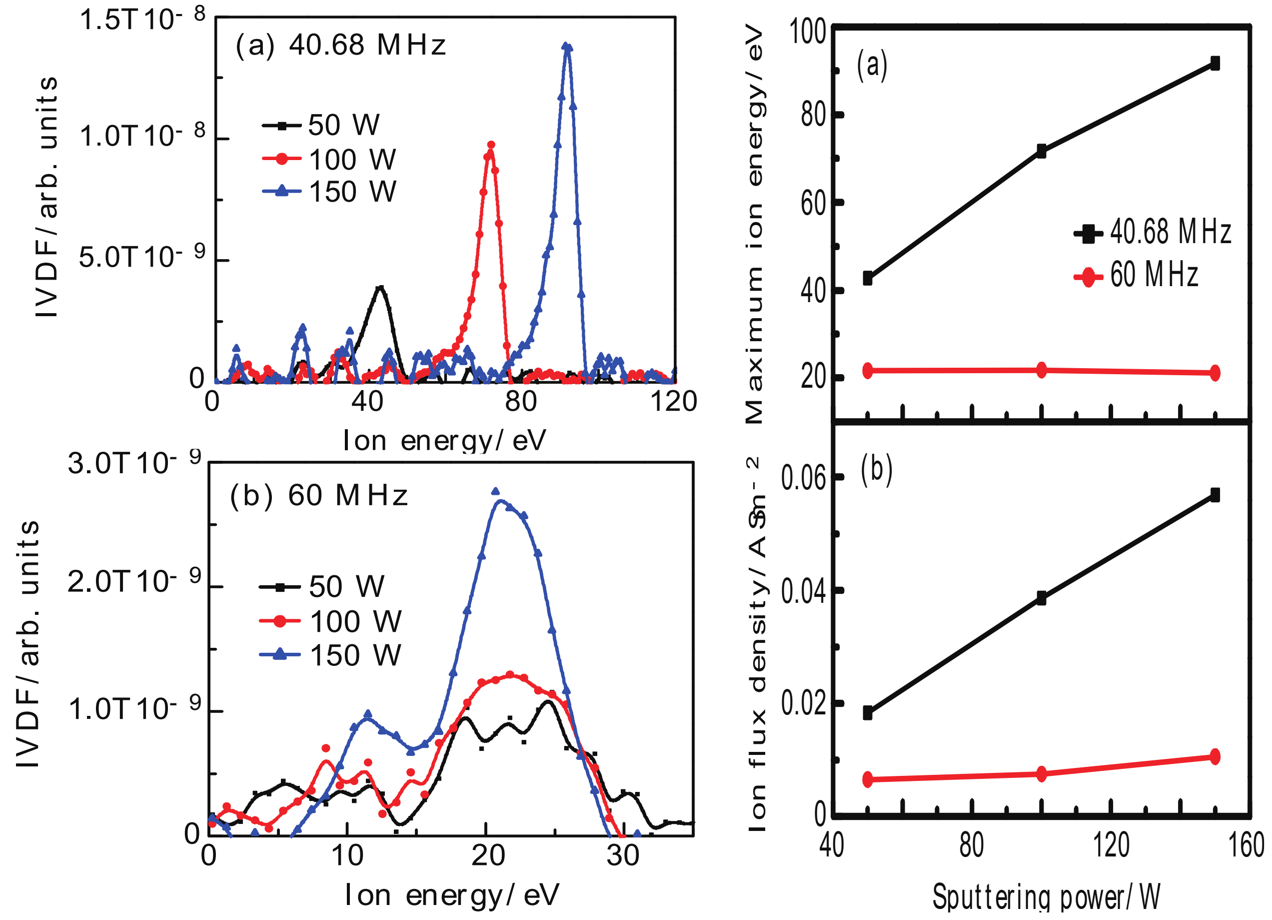
Measurement of Ion Flux and Ion Energy for changing driving frequency and sputtering power

Effect of Driving Frequency on the structure of silicon grown on Ag (111) films by very high frequency magnetron sputtering

Guo J M et al, College of Physics, Optoelectronics and Energy, Soochow University, China
Key Laboratory of Thin Films of Jiangsu Province, Soochow University, China
Medical College, Soochow University, China

DOI: [10.1088/1674-1056/26/6/065207](https://doi.org/10.1088/1674-1056/26/6/065207)

The objective of this paper was investigate the effects that the driving frequency and sputtering power have on the Ion Energy and Ion flux and therefore the growth behaviour.



Examples of the IEDF for 50 – 150 W for 40.68 and 60 MHz along with the maximum energy and ion flux

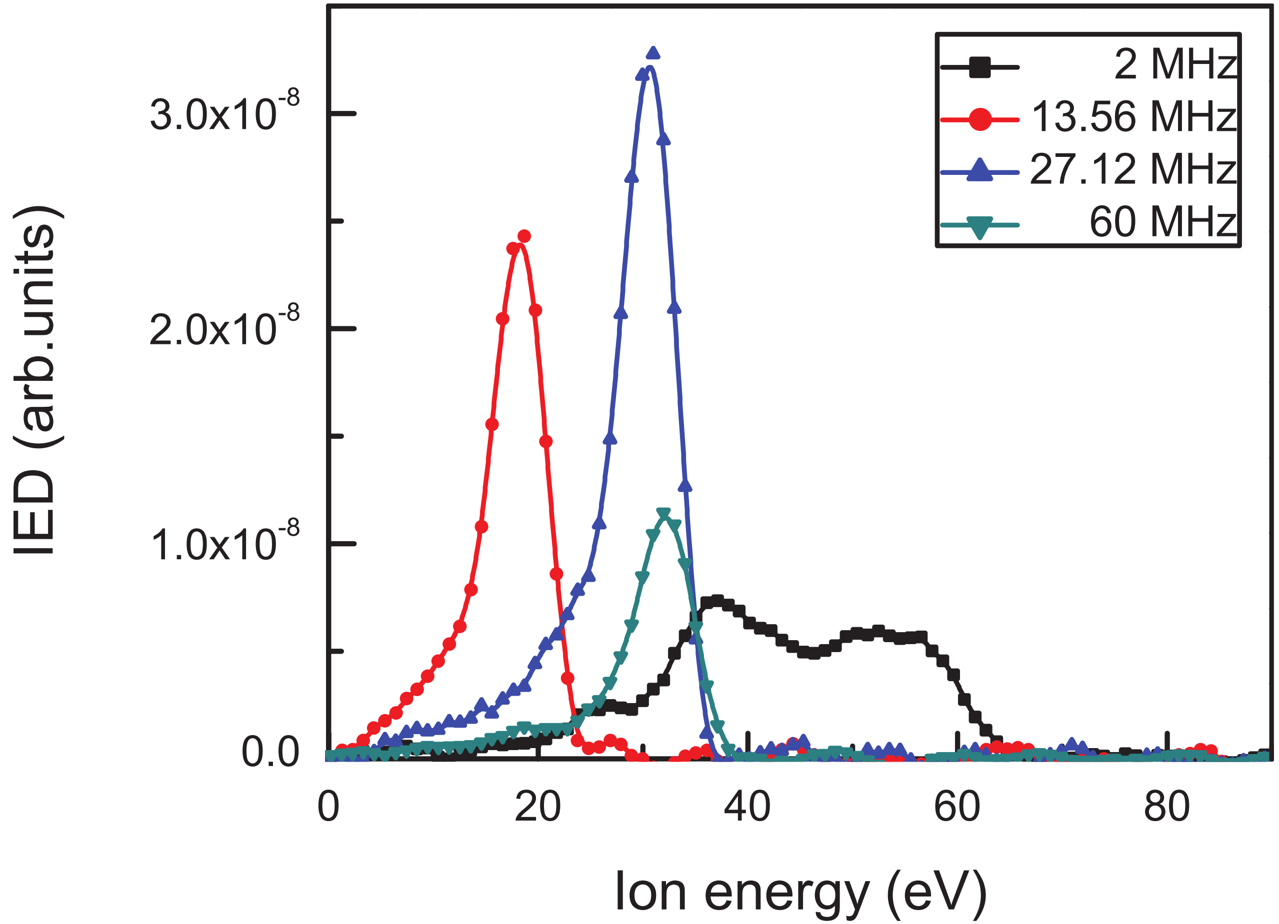
Measurement of the IEDF for various driving frequencies

Effect of Driving Frequency on growth and structure of Silicon films deposited by radio-frequency and very-high-frequency magnetron sputtering.

Haijie He et al, School of Physics Science and Technology, Soochow University, People's Republic of China
Medical College of Soochow University, People's Republic of China

DOI: : [10.1149/2.008405jss](10.1149/2.008405jss)

The objective of this paper was to investigate the effects that the driving frequency of the source (from 2 MHz to 60 MHz) had on the IEDF.



Examples of the IEDF for 2 to 60 MHz driving frequency

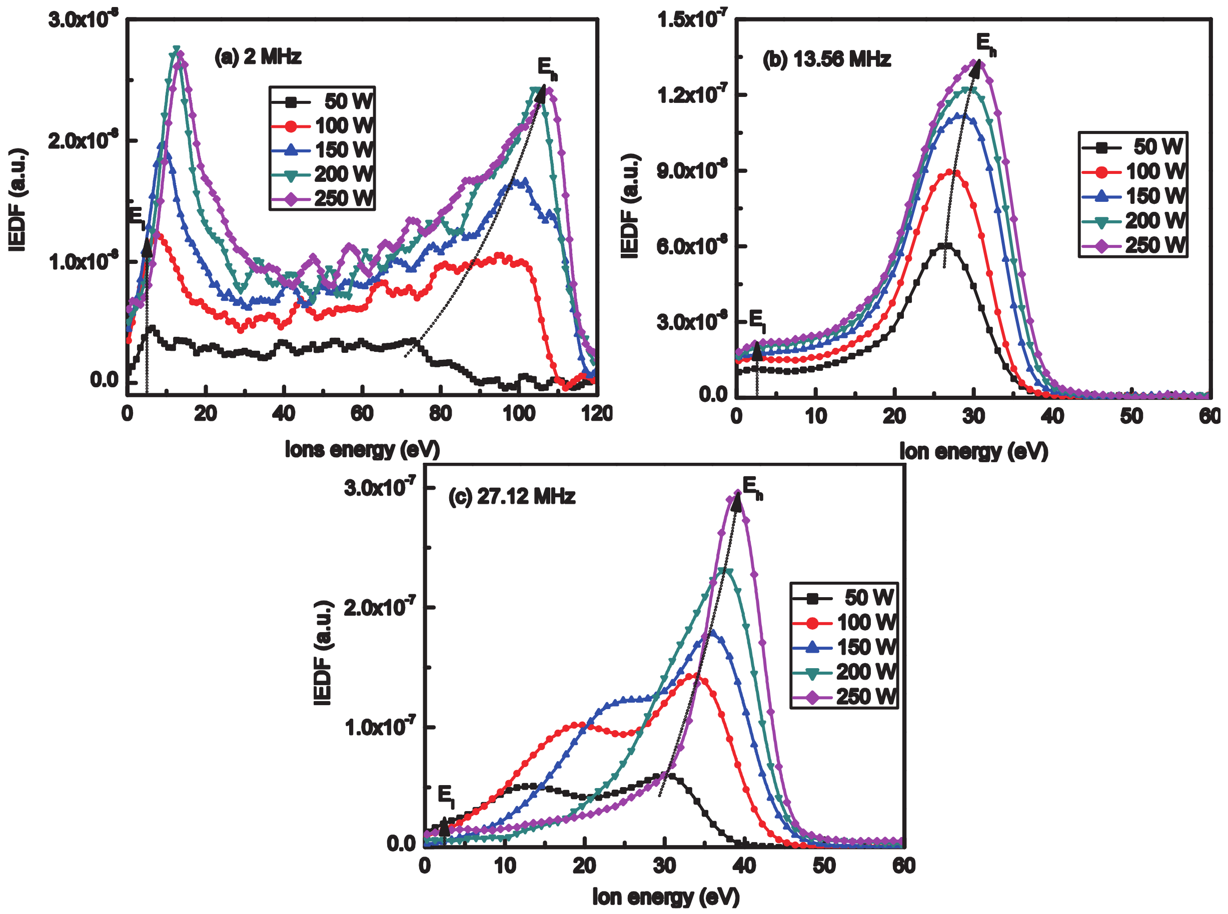
Effect of the IEDF for carious driving frequencies and sputtering power

Structural properties and preparation of Si-rich SiC thin films by RF magnetron sputtering

Yisong He et al, College of Physics, Optoelectronics and Energy, Soochow University, People's Republic of China
Key Laboratory of Thin Films of Jiangsu Province, Soochow University, People's Republic of China
Medical College, Soochow University, People's Republic of China

DOI: : 10.1016/j.apsusc.2015.12.097

The objective of this paper was to investigate the effects that the driving frequency and sputtering power have on the deposition of Si-rich $Si_{1-x}C_x$ films.



Examples of the IEDF for 2, 13.56 and 27.12 MHz for powers ranging from 50 – 250 W

Impedans PLASMA MEASUREMENT

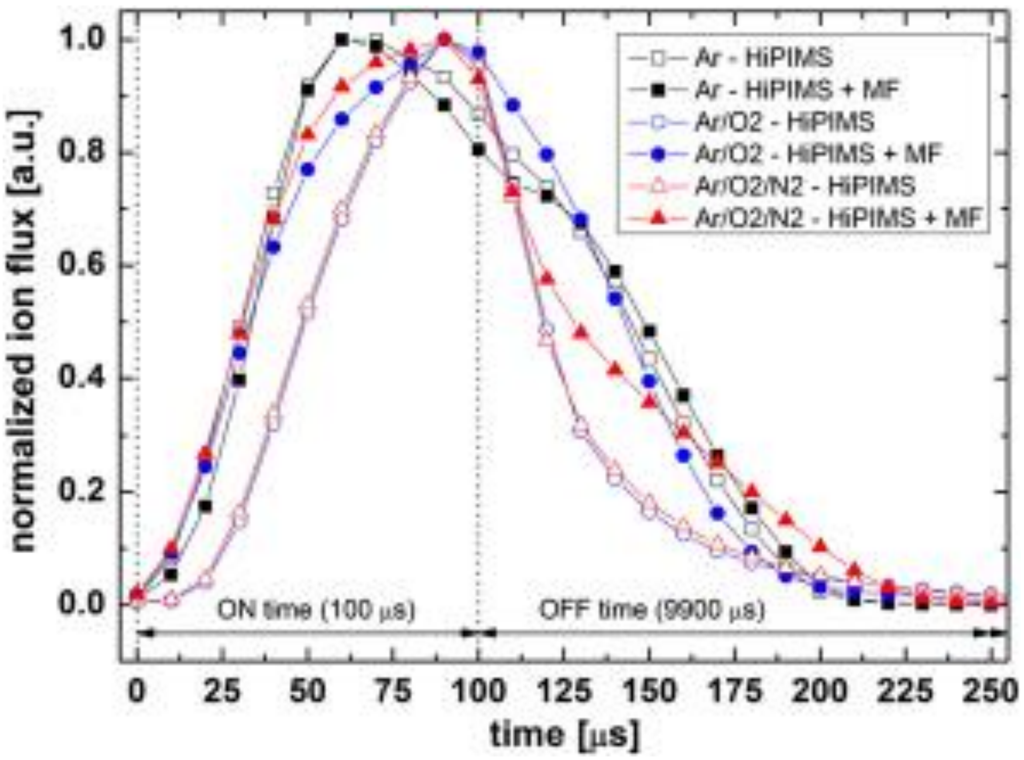
Time Resolved Ion flux measurement in a HiPIMS/MF system

Investigation of reactive HiPIMS and MF sputtering of *TiO_2* crystalline thin films

Olejníček J et al, Institute of Physics, Academy of Sciences of the Czech Republic, Czech Republic

DOI: : 10.1016/j.surfcoat.2013.05.038

The objective of this paper was to investigate the effects of different magnetron sputtering sources and gas mixtures as tools for the deposition of rutile TiO_2 films without external heating of the substrate.



Normalised Ion flux for HiPIMS and HiPIMS/MF for different gas combinations

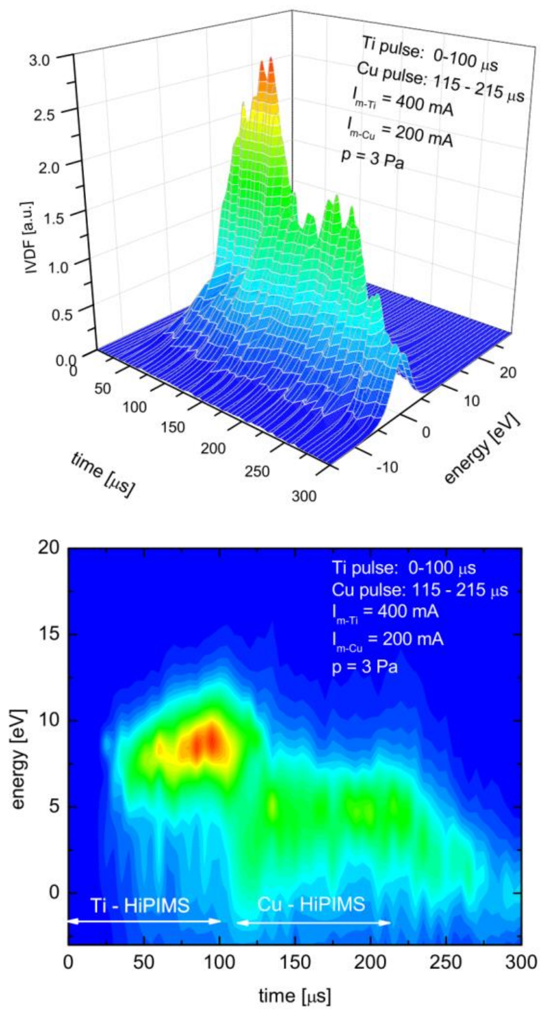
Time Resolved IVDF for a Dual-HiPIMS discharge

Growth and properties of Ti-Cu films with respect to plasma parameters in dual-magnetron sputtering discharges

Stranak V et al, Institut für Physik, Ernst-Moritz-Arndt-Universität Greifswald, Germany
Institute of Physics v. v. i., Academy of Science of the Czech Republic, Czech Republic
Faculty of Mathematics and Physics, Charles University in Prague, Czech Republic
Institut für Physik, Ernst-Moritz-Arndt-Universität Greifswald, Germany

DOI: : [10.1140/epjd/e2011-20393-7](https://doi.org/10.1140/epjd/e2011-20393-7)

The objective of this paper was to investigate the ion energy for different Magnetron discharges with respect to Ti-Cu films.



Time Resolved measurement of the IVDF for a dual-HiPIMS discharge

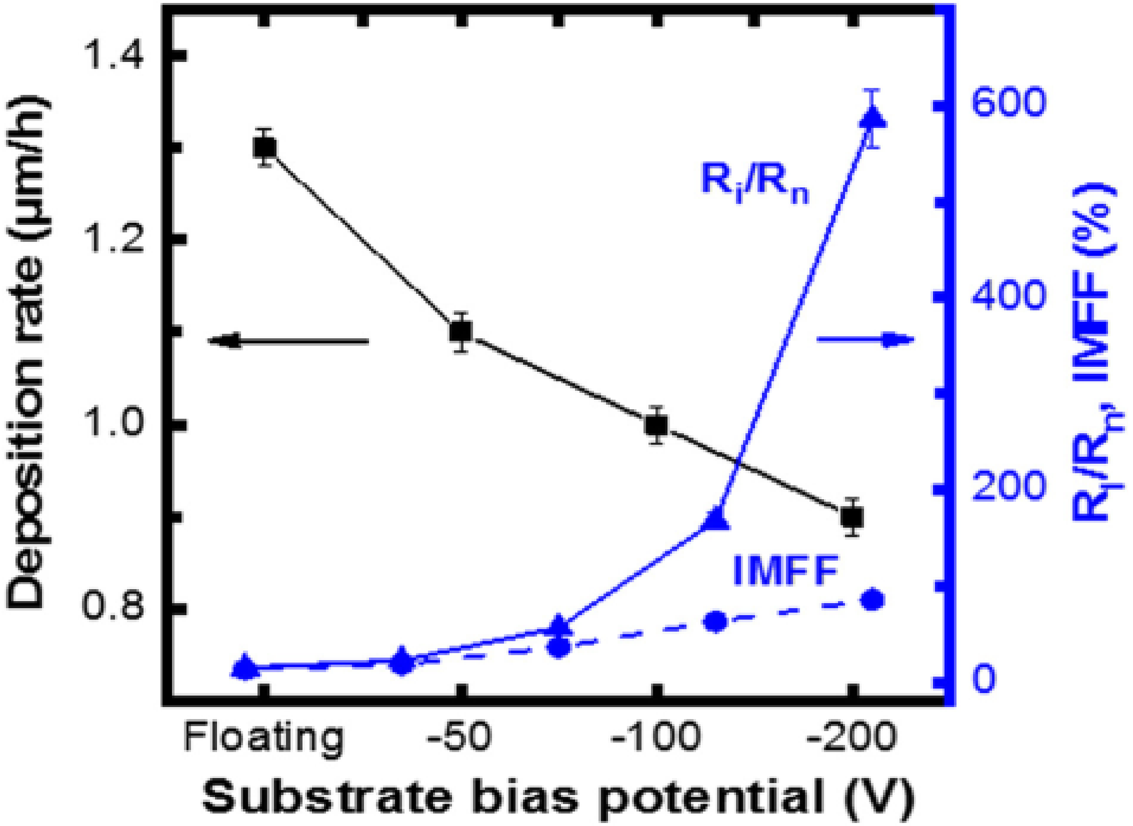
Measurement of the deposition rates and Ion: Neutral fraction in a HiPIMS discharge

Effects of HiPIMS discharges and annealing on Cr-Al-C thin films

Ougier M et al, Université Paris-Saclay, CEA, Service d'Études Analytiques et de Réactivité des Surfaces, France
Université Paris-Saclay, CEA, Cross-Cutting Program on Materials and Processes Skills, France

DOI:10.1016/j.surfcoat.2020.126141

The Quantum sensor was used in this paper to measure the Deposition rates and the Ion: Neutral ratio.



Effect of the Substrate bias potential on the Deposition Rate and the Ion/Neutral ratio

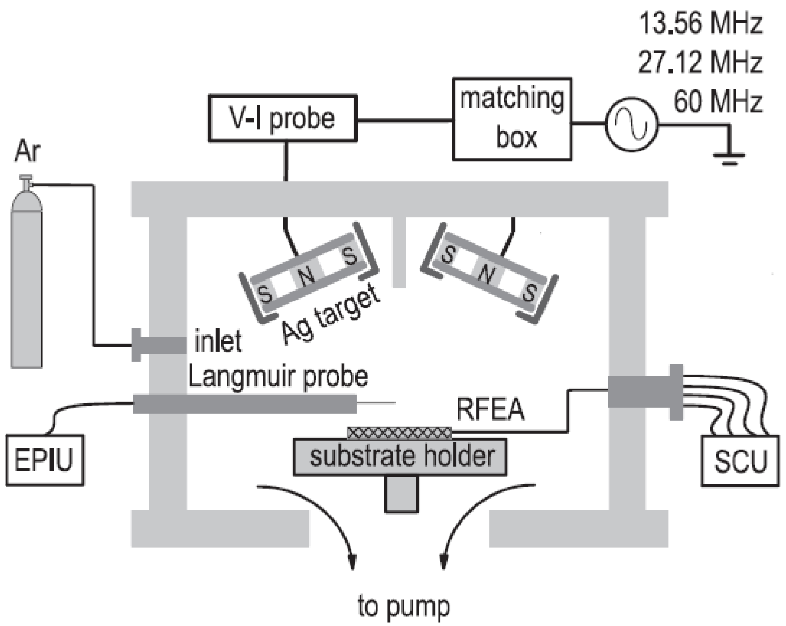
Measurement of the ion velocity distribution functions in RF and Very high frequency magnetron sputtering system

Effect of gas pressure on ion energy at substrate side of Ag target radio-frequency and very-high-frequency magnetron sputtering discharge

Weichen Ni et al, School of Physics Science and Technology, Soochow University, People's Republic of China
Key Laboratory of Thin Films of Jiangsu Province, Soochow University, People's Republic of China
Medical College, Soochow University, People's Republic of China

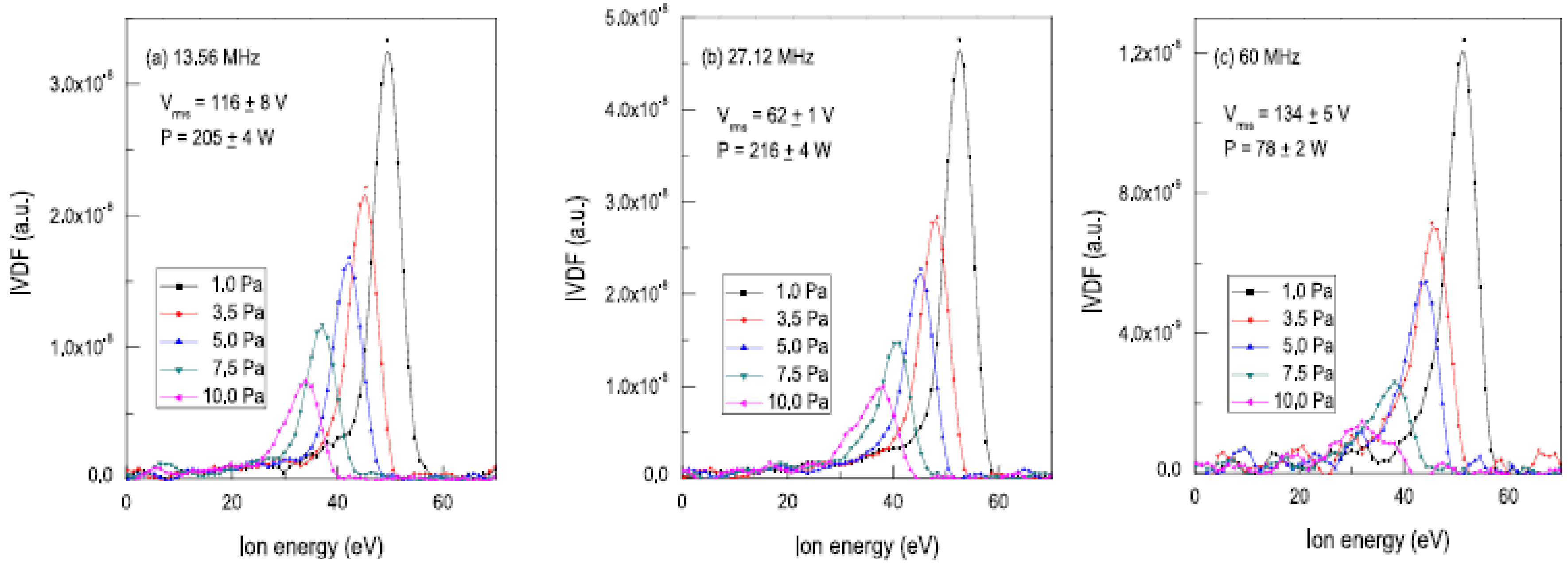
DOI: https://doi.org/10.1088/2058-6272/ac3c3e

In this work, the ion energy at the substrate side of Ag target magnetron sputtering driven by 13.56 MHz, 27.12 MHz and 60 MHz in the pressure range of 1.0–10.0 Pa was investigated using a Semion HV-2500 retarding field energy analyzer (RFEA).

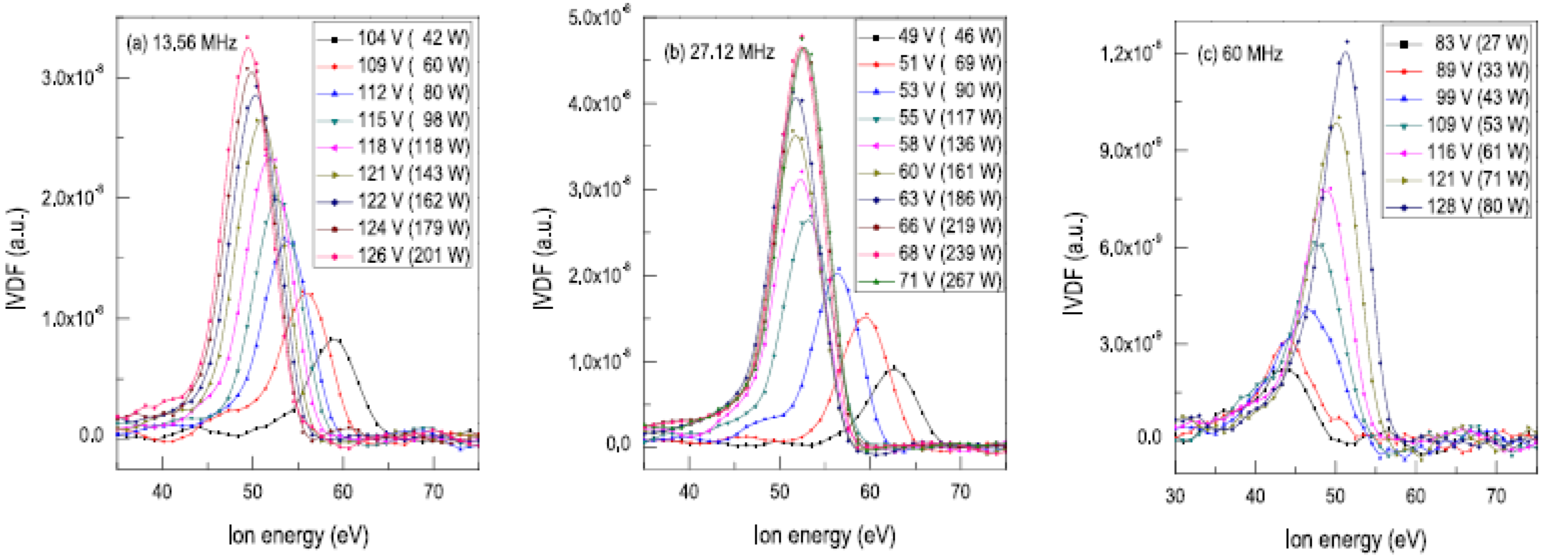


Schematic of the magnetron sputtering discharge setup.

Measurement of the ion velocity distribution functions in RF and Very high frequency magnetron sputtering system

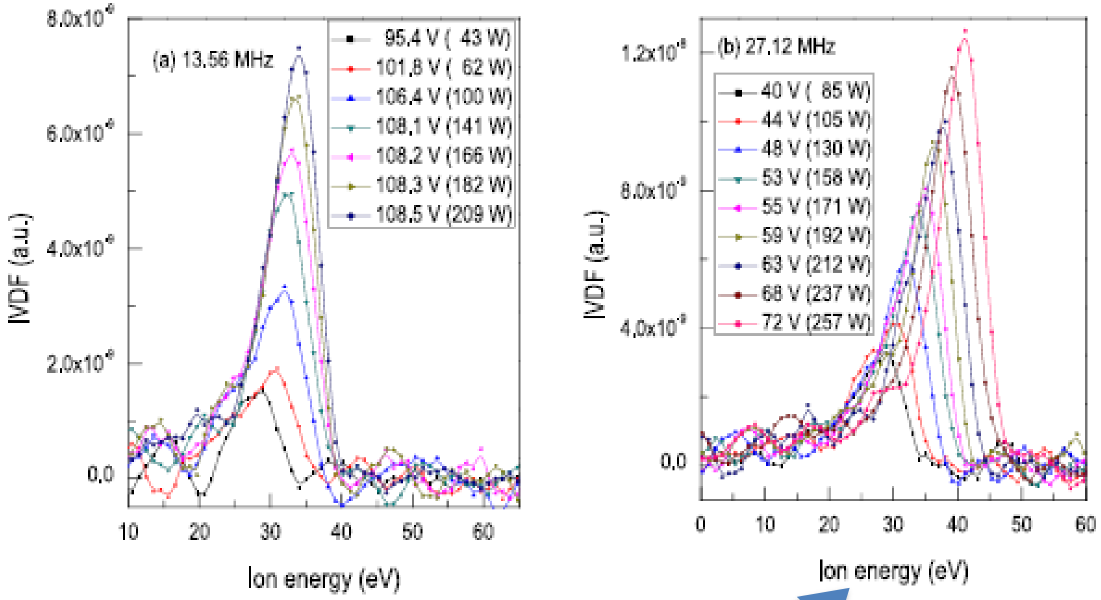


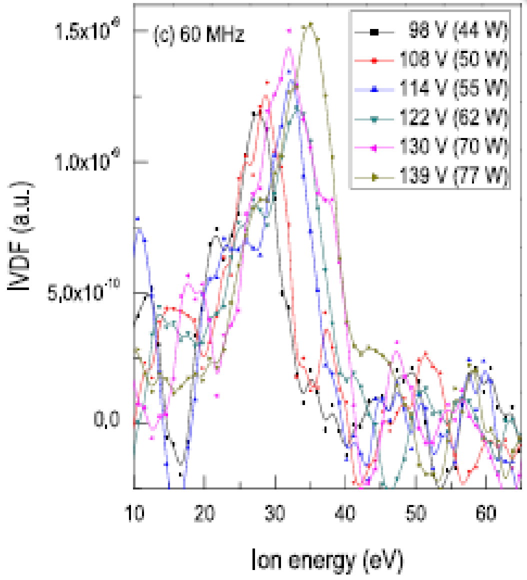
Variation of IVDFs with pressure for the (a) 13.56 MHz, (b) 27.12 MHz and (c) 60 MHz driven magnetron sputtering discharge at a discharge voltage of Vrms = 116 ± 8V, Vrms = 62 ± 1 V and Vrms =134 ± 5 V, respectively.



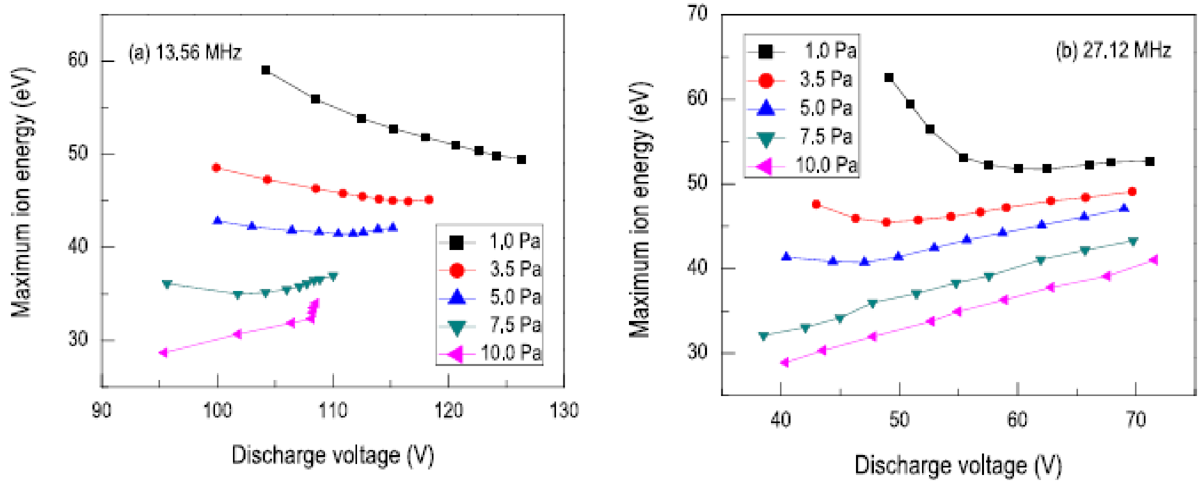
Variation of IVDFs with discharge voltage (or sputtering power) at the pressure of 1.0 Pa for the (a) 13.56 MHz, (b) 27.12 MHz, and (c) 60 MHz driven magnetron sputtering discharge.

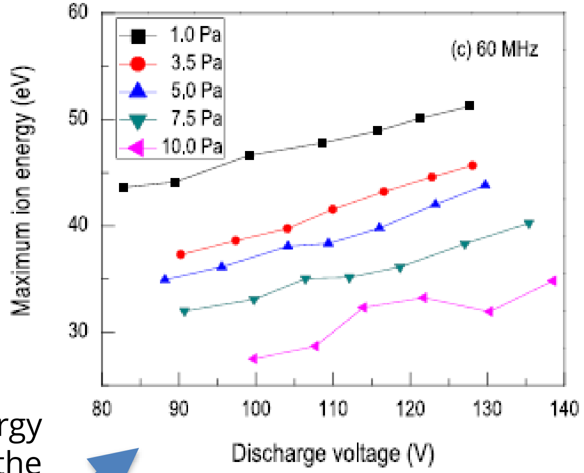
Measurement of the ion velocity distribution functions in RF and Very high frequency magnetron sputtering system





Variation of IVDFs with discharge voltage (or sputtering power) at the pressure of 10 Pa for the (a) 13.56 MHz, (b) 27.12 MHz, and (c) 60 MHz driven magnetron sputtering discharge.





Variation of maximum ion energy with discharge voltage at the pressure of 10 Pa for the (a) 13.56 MHz, (b) 27.12 MHz, and (c) 60 MHz driven magnetron sputtering discharge.

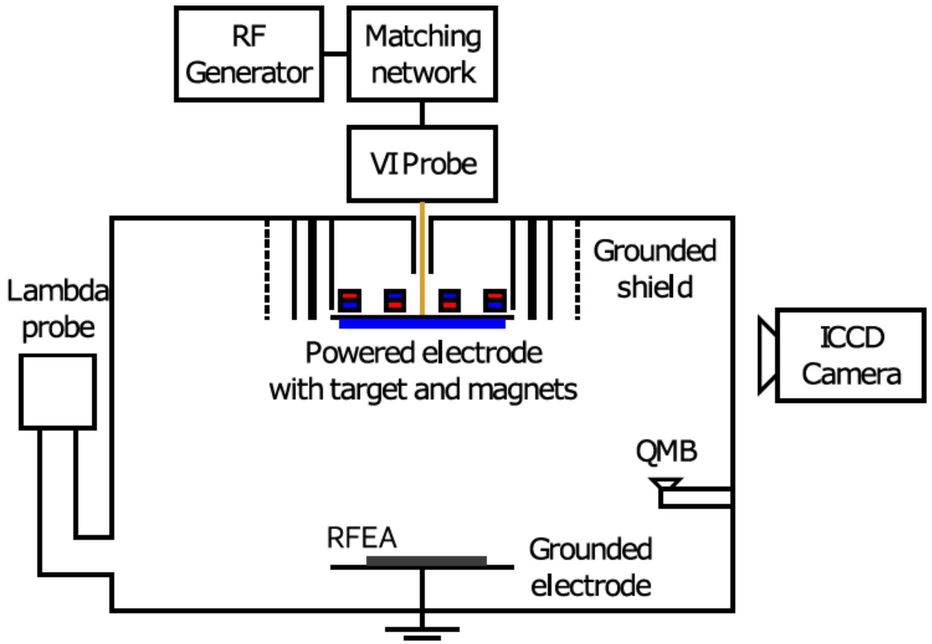
Hysteresis effect in the DC Self bias as a function of reactive gas flow in a CCP RF Magnetron discharge

Experimental investigations of plasma dynamics in the hysteresis regime of reactive RF sputter processes

Roggendorf J et al, Institute of Electrical Engineering and Plasma Technology, Ruhr University Bochum, GERMANY
Institute of Automation and Computer Control, Ruhr University Bochum, GERMANY
School of Physics, Dalian University of Technology, CHINA
Institute of Electrical Engineering and Plasma Technology, Ruhr-Universitaet-Bochum, GERMANY
Institute of Automation and Computer Control, Ruhr-Universitaet-Bochum, GERMANY
Institute of Electrical Engineering and Plasma Technology, Ruhr-University Bochum, GERMANY

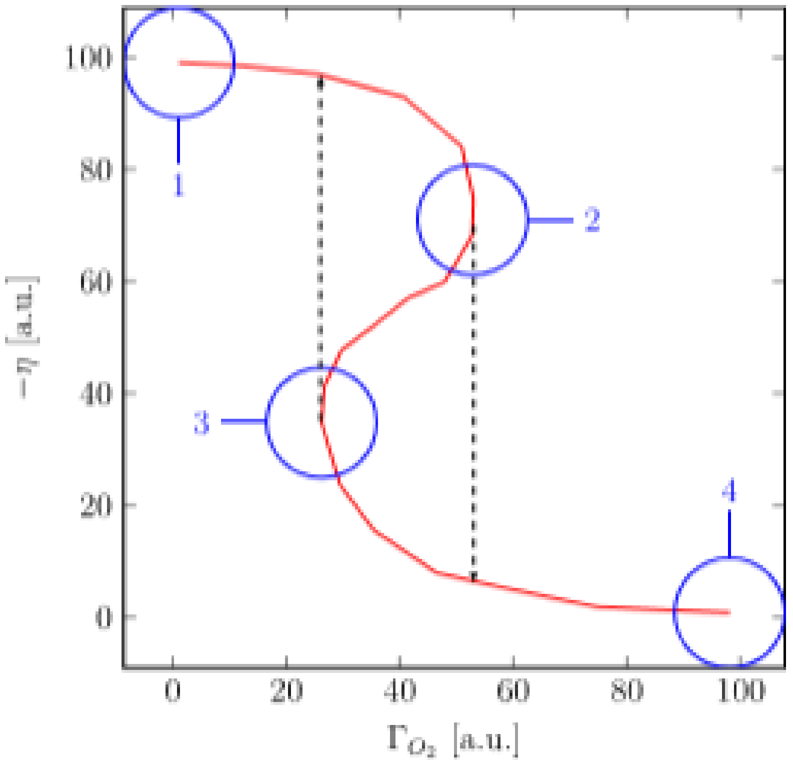
DOI: https://doi.org/10.1088/1361-6595/ac7413

In this work, experimental analysis of the physics in the hysteresis regime of magnetized reactive sputter processes have been presented, where the same reactive gas admixture can lead to different discharge characteristics depending on the previous state of the plasma. A low pressure capacitively coupled RF discharge (13.56 MHz) with a magnetron-like magnetic field topology adjacent to the target is operated in argon gas with a variable admixture of O_2.

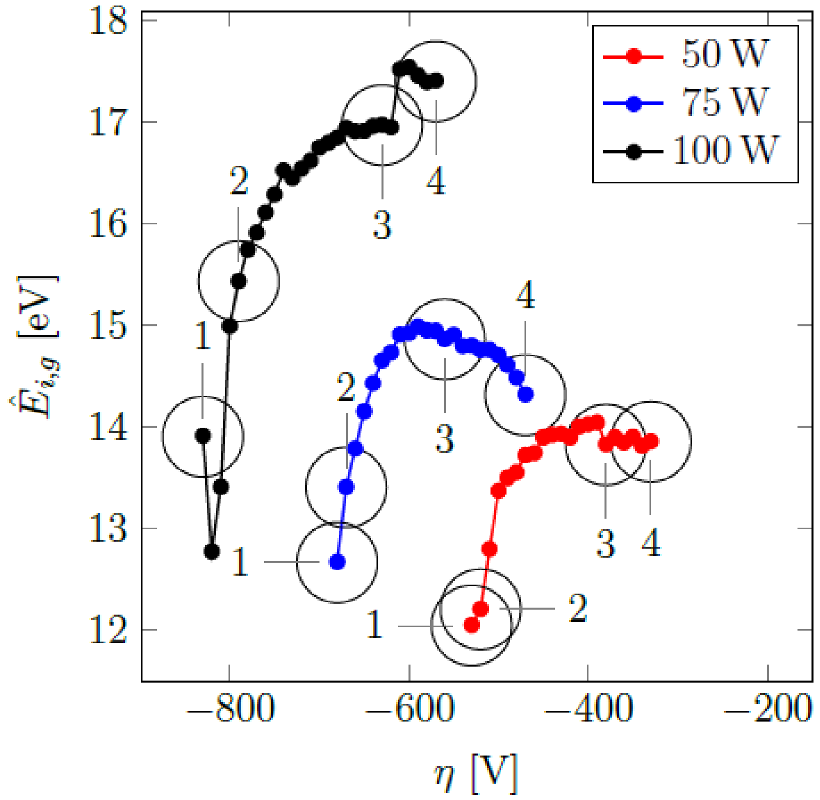


Schematic of the plasma reactor including the external electrical circuit, permanent magnets embedded in the powered electrode to generate the magnetron like magnetic field, and diagnostics.

Hysteresis effect in the DC Self bias as a function of reactive gas flow in a CCP RF Magnetron discharge



Schematic illustration of the S-curve with operating points 1 to 4, which indicate different regimes of the plasma process (metallic, transition, poisoned). The dashed arrows indicate the hysteresis curve, whereas the parameter range indicated by the red line, i.e. the transition regime between operating points 2 and 3, can be accessed based on a stabilizing feedback loop.



Peak ion energy $E_{i,g}$ (peak in the IEDF) at the grounded substrate electrode as a function of the DC selfbias for different applied RF powers and at a constant pressure of p = 2Pa and constant Ar gas flow of Γ_{Ar} = 10 sccm. The numbered circles mark the operating points along the S-curve.

Impedans PLASMA MEASUREMENT

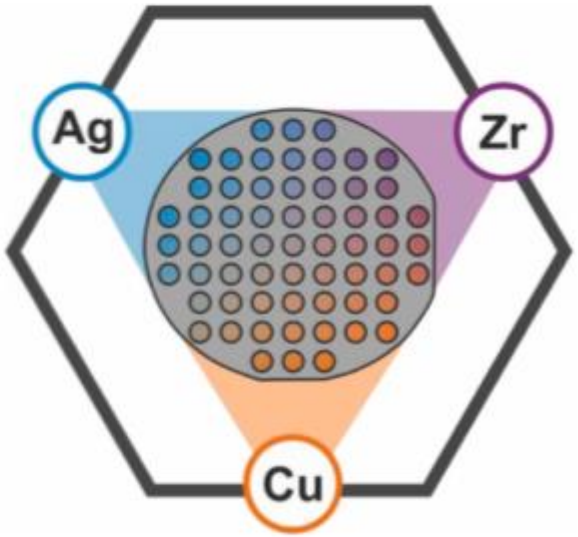
High power impulse magnetron sputtering (HiPIMS) of copper, silver and zirconium: influence of different pulse widths (25, 50 and 100 µs)

Influence of HiPIMS pulse widths on the deposition behaviour and properties of CuAgZr compositionally graded films

L. Lapeyre et al, Bern University of Applied Sciences, Institute for Applied Laser, Photonics and Surface Technologies ALPS, Quellgasse, Switzerland
Empa, Swiss Federal Laboratories for Materials Science and Technology, Laboratory for Mechanics of Materials and Nanostructures, Switzerland
Tofwerk AG, Schorenstrasse, Switzerland

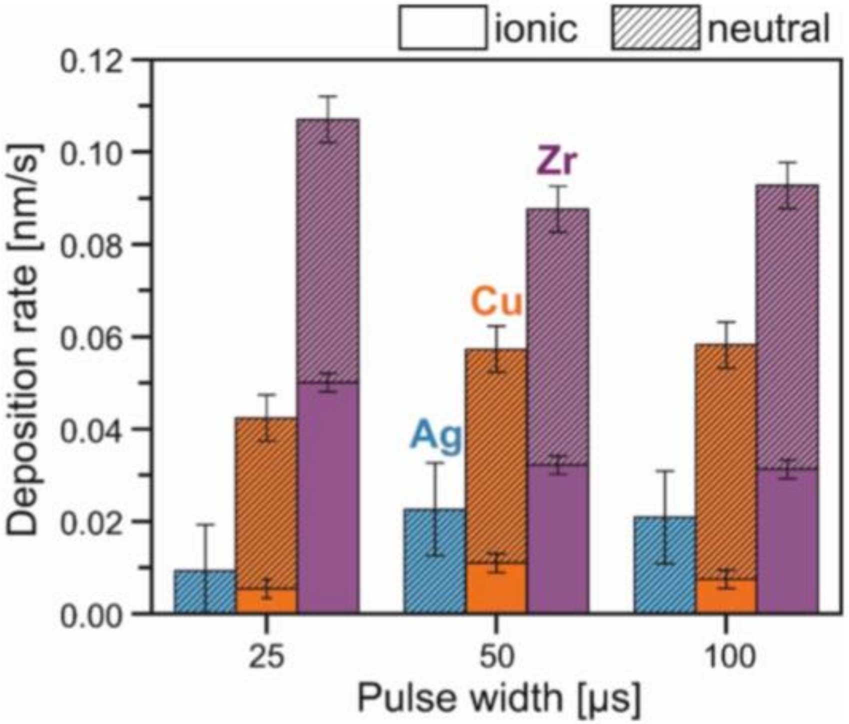
DOI: https://doi.org/10.1016/j.surfcoat.2022.129002

In this work, Three HiPIMS pulse widths were utilised to produce CuAgZr libraries. In situ plasma diagnostics identified the influence of pulse width, on each target. The microstructures of CuAgZr coatings were linked to the deposition conditions. Ionised flux fraction measurements were performed using a ∅ 100 mm Quantum™ System m-QCM probe (Impedans Ltd., Ireland), to determine the mass deposition rate of neutral species and the total (neutral +ions) mass deposition rate.

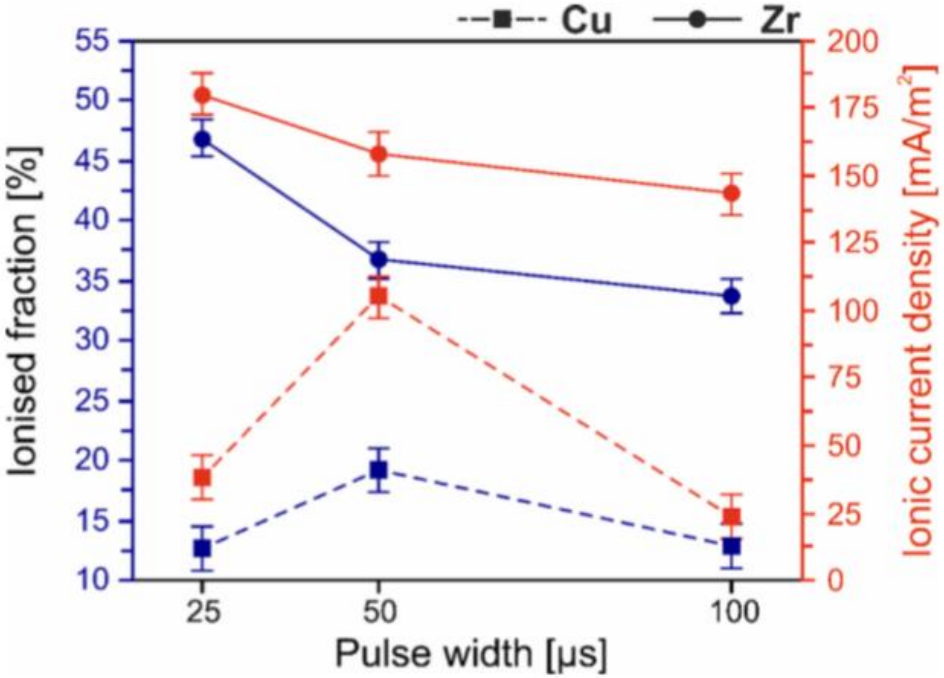


Schematic of plasma source placement vs substrate and mask position

High power impulse magnetron sputtering (HiPIMS) of copper, silver and zirconium: influence of different pulse widths (25, 50 and 100 µs)



Ag, Cu and Zr deposition rates, with distribution of neutral and ionic species, for 25, 50 and 100 µs pulse widths (detailed values given in supplementary information)



Ionized fraction and ionic current density for Cu and Zr, with no ionic signal measured during Ag discharges.

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