



Fall Series 2021
Coating and Printing
4 Nov 2021



INSPIRE CONNECT DISCUSS IGNITE

Low Temperature Deposition of Functional Coatings: Advantages and Challenges of Ionized PVD

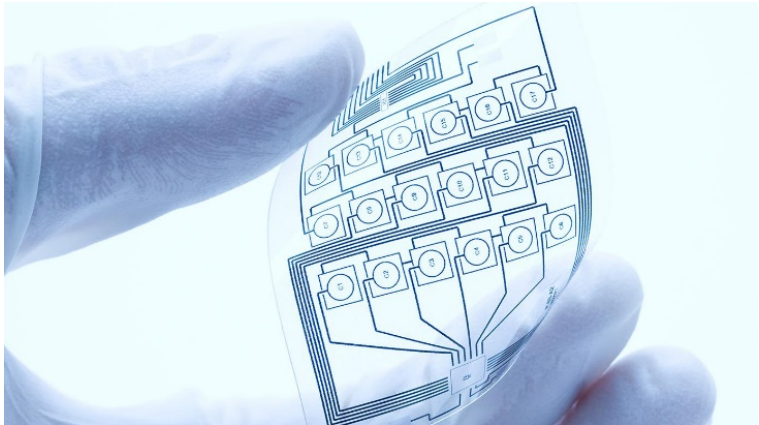
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LOW TEMPERATURE DEPOSITION of FUNCTIONAL COATINGS: Advantages and Challenges of Ionized PVD

- Compatibility with low temperature processes
- Can be used for temperature sensitive substrates
- Possibility of development of metastable materials



Ionized PVD : $\Gamma_{M+} > \Gamma_M$

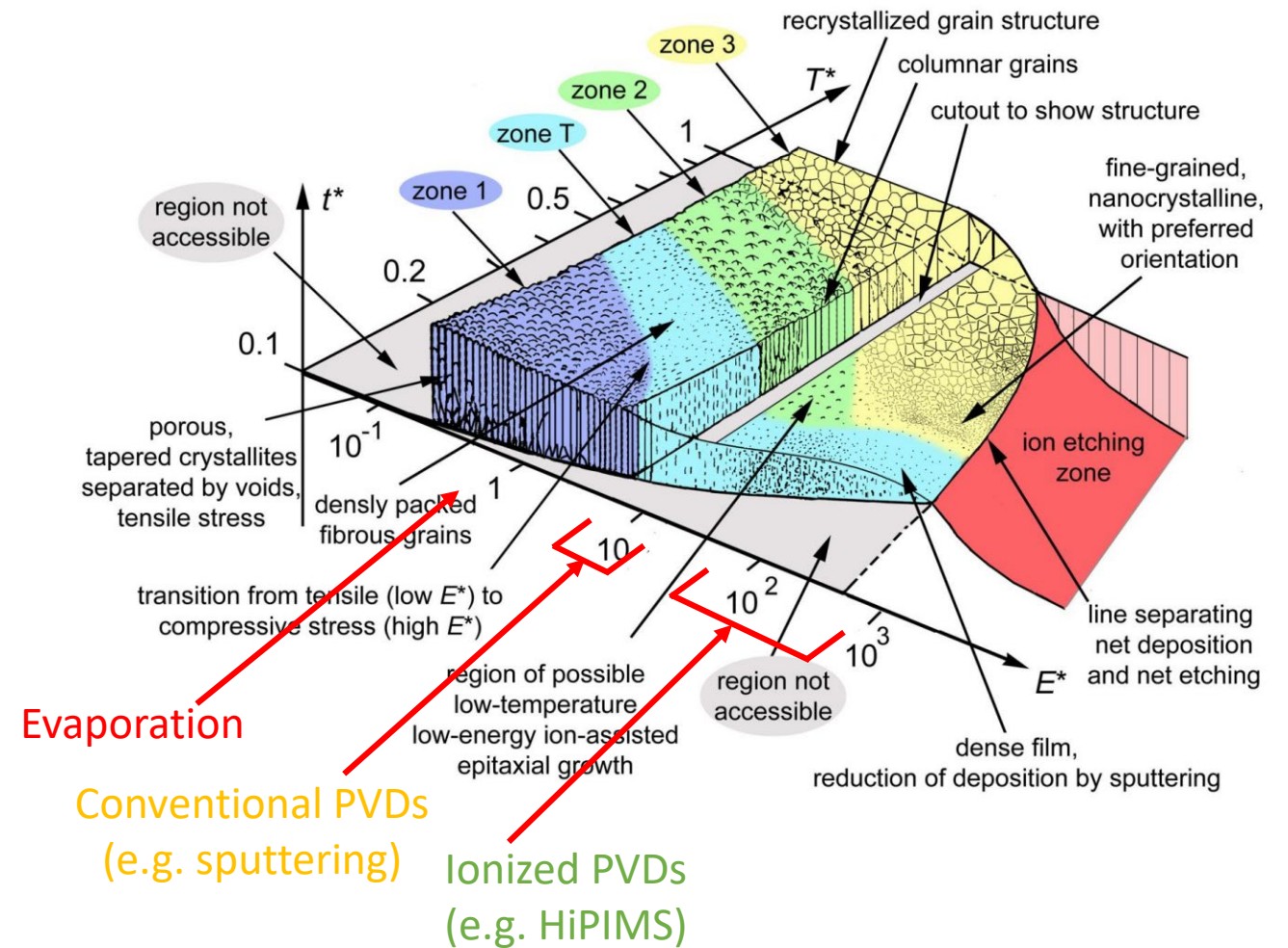


Figure 1. Structure zone diagram applicable to energetic deposition. ¹

1. Anders, A. (2010). A structure zone diagram including plasma-based deposition and ion etching. *Thin Solid Films*, 518(15), 4087-4090.

Low Temperature Deposition of Functional Coatings: Advantages and Challenges of IONIZED PVD

- HiPIMS: High-Power Impulse Magnetron Sputtering

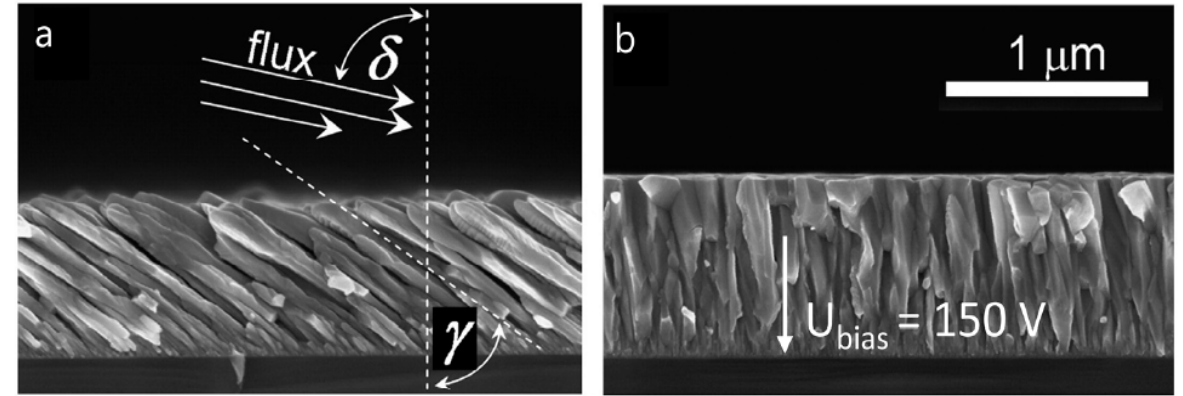
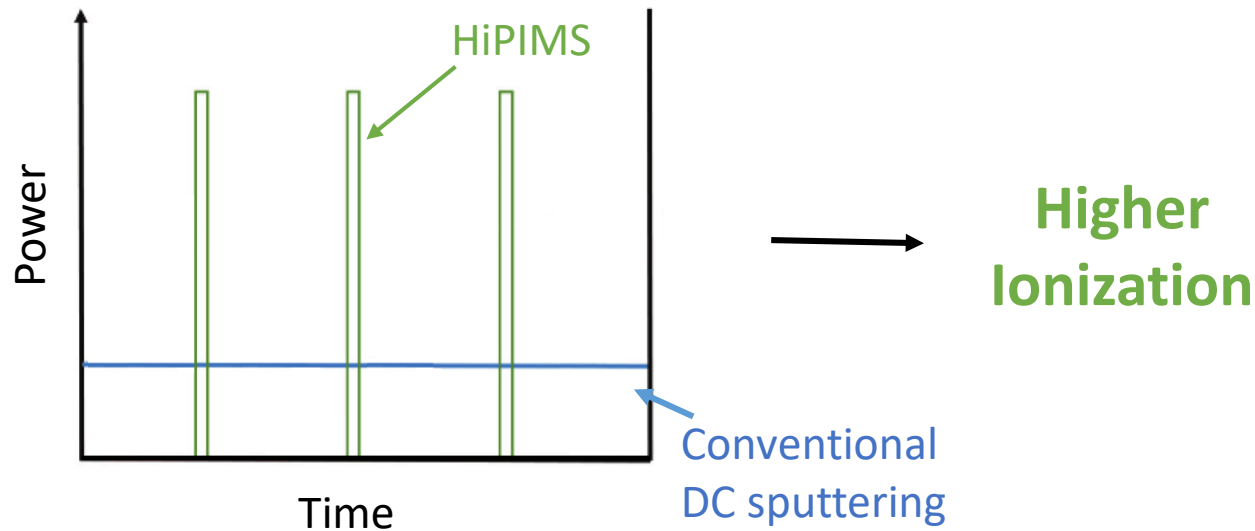
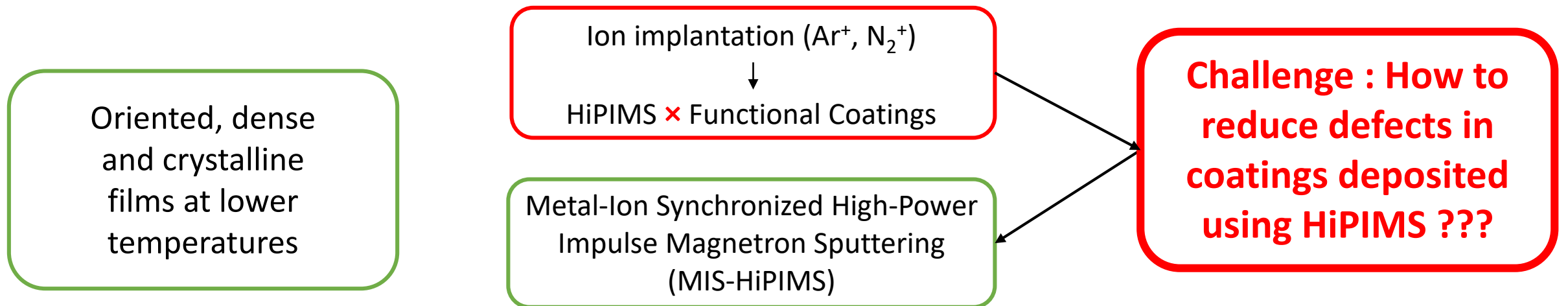


Figure 2: High degrees of ionization enable control of the grains orientation. a) Conventional DC sputtering b) HiPIMS with a substrate bias.²



Reducing Defects in the Film using Metal Ion Synchronized - HiPIMS

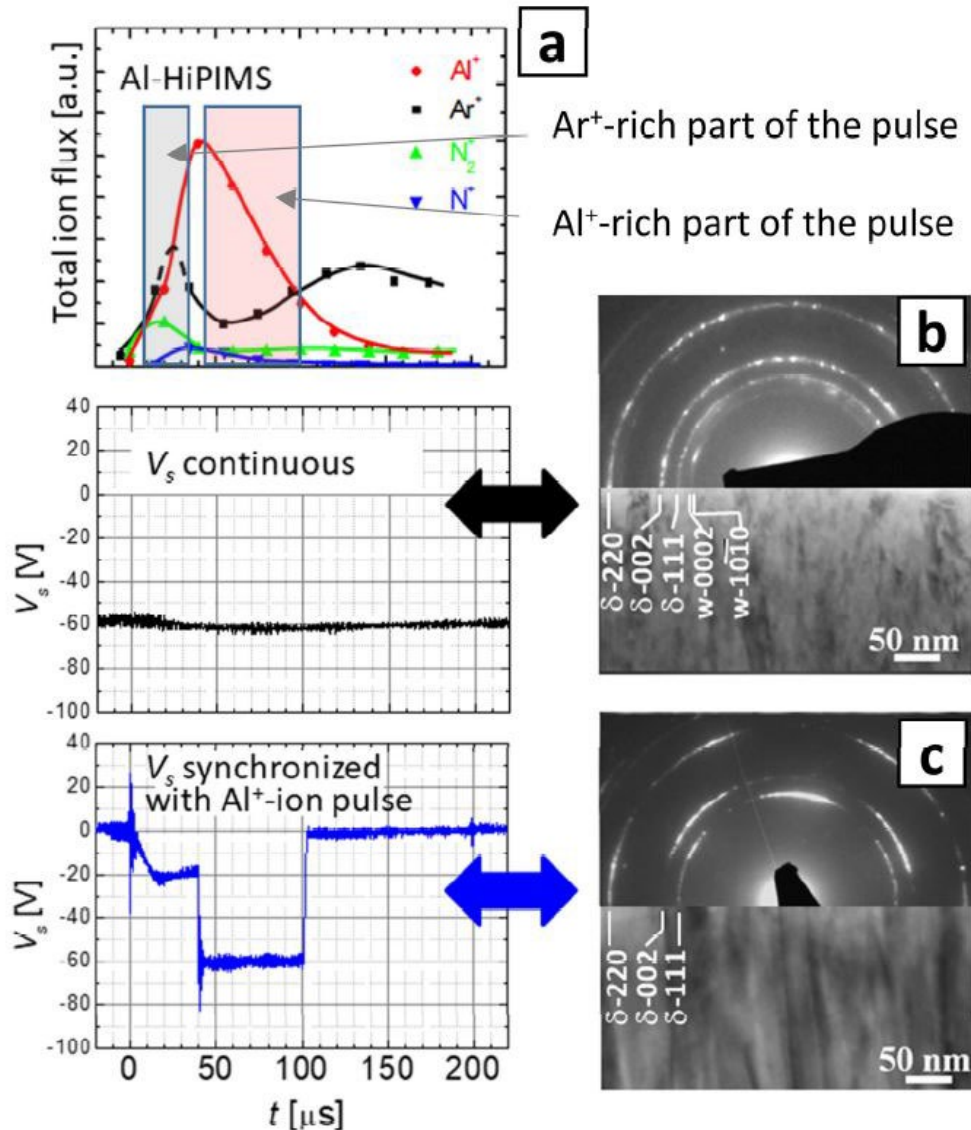


Figure 3: Al-HiPIMS/Ti-DCMS of TiAlN.³

Used previously for [HARD COATINGS](#).

Because of different masses ions arrive at the substrate at different times of each pulse.

Substrate bias pulse can be tailored accordingly to attract metal ions.

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**How do you deposit
functional coatings
at low temperature
???**

Acknowledgement

Swiss National Science Foundation (SNF), ETH Zürich

