



ENEA activities in 2021: W-based coatings with pre-defined properties (incl. SEM, AFM, TDS) produced for plasma experiments – plans and capabilities

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2021 - 2022 activity



In 2021 and 2022 we were asked to produce **W-based coatings with pre-defined properties (incl. SEM, AFM, TDS characterization) produced for analyses and plasma experiments**

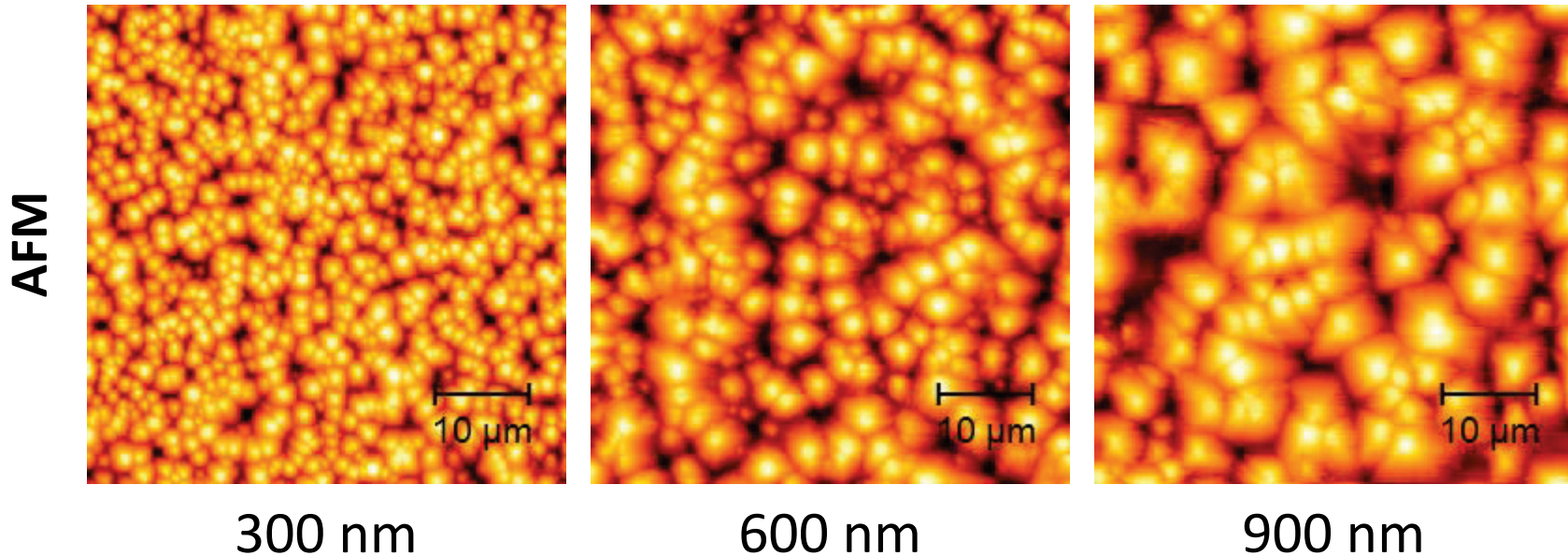
More specifically:

- **W samples on flat and rough surfaces to be exposed in GyM under SP B.1:**
 - Flat and pyramidal-Si samples (regular roughness)
 - Flat and rough graphite (random roughness)
 - → substrate preparation by ISTP-CNR + W deposition by Polimi.
- **W samples for the LIBS community under SP X.2:**
 - W+O films
 - Compact W films
 - W+N+O films

Si samples for SP B.1 (update March 2022)



- ✓ Enhancement of process **repeatability**
- ✓ Pyramids **surface coverage** $\approx 100\%$
- ✓ **3 different** values of average roughness (**Ra**): “300”, “600” and “900” nm

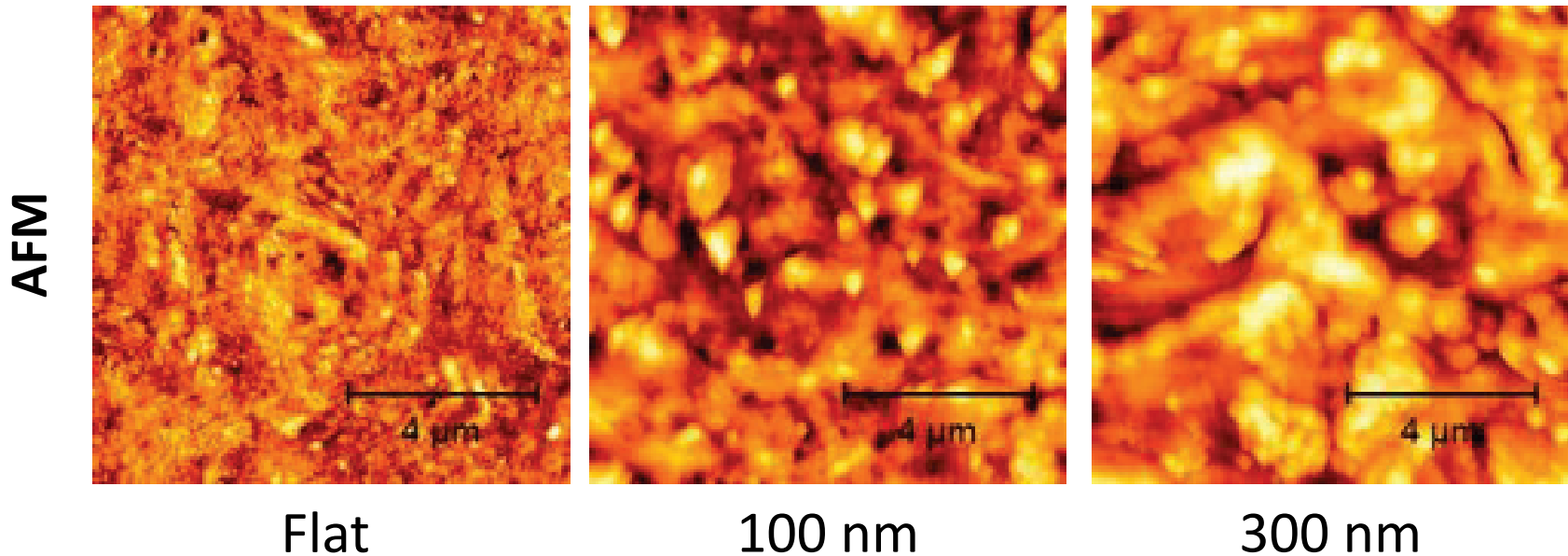


- Si samples for SP B1 experiments in GyM: **Ready**

Graphite samples for SP B.1 (update March 2022)



- ✓ 3 different values of average roughness (R_a): “Flat”, “100” and “300” nm

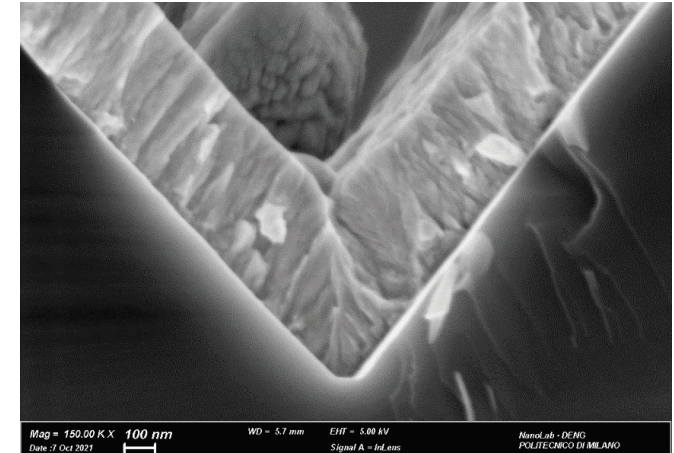
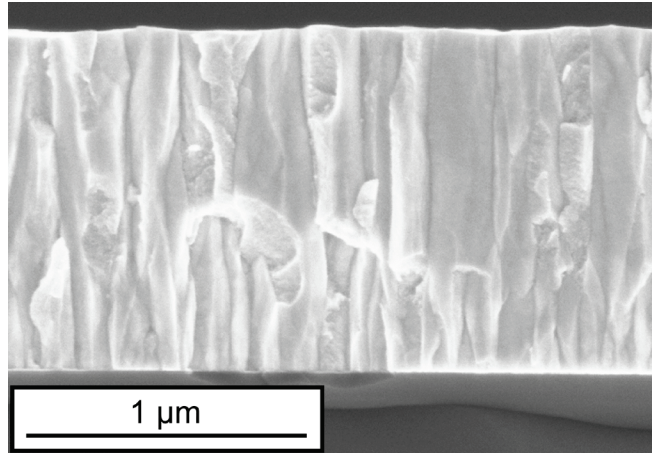


- Graphite samples for SP B1 experiments in GyM: **Ready**

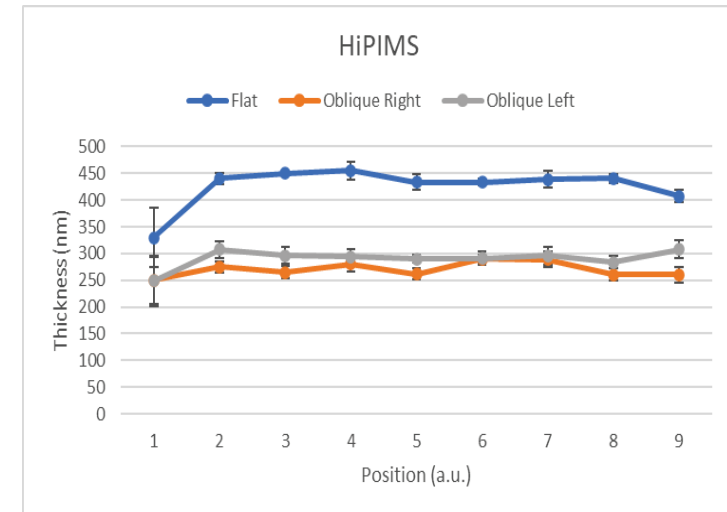
Samples for SP B.1 - ISTP



HiPIMS W coating



- Optimization of W coverage and film adhesion – **achieved**
- Analysis of W thickness for comparison with exposed samples – **completed**
- Improved thickness from up to 1000 nm.
- Optimal thickness uniformity on two sides of pyramids



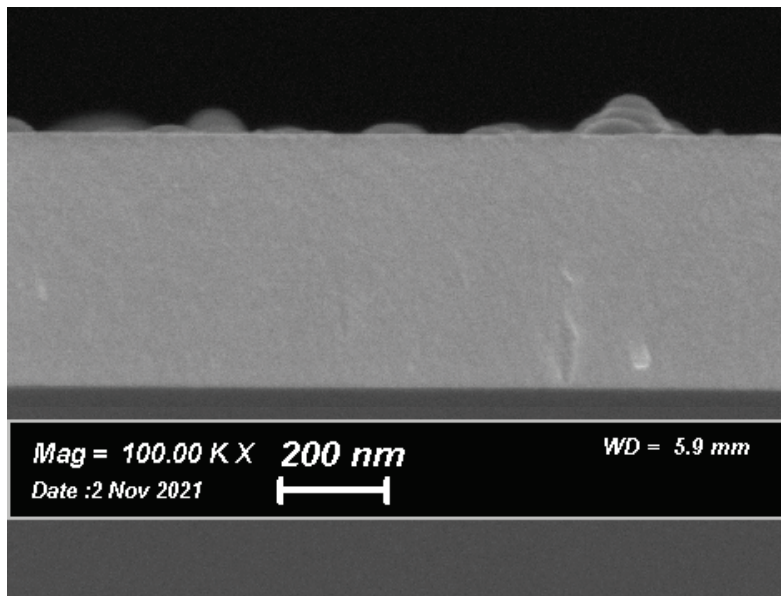
Samples for SP X.2



PLD coating

Optimization of W+O samples with O content around 15-20% – **completed**

- 14 samples produced for film characterization (SP B.3, SP B.4) - **completed**
- 12 samples produced for LIBS (SP X.2) - **completed**
- 6 samples on Mo disks produced for D and He loading in MAGNUM (SP B.1) - **completed**
- Waiting for PSI-2 Mo substrates for completing the SP B.1 batch



Future samples



Samples for SP B.1

- Production of W-coatings, for GyM exposures, on:
 - Flat and pyramidal-Si
 - Flat and rough graphite

Foreseen within April 2022

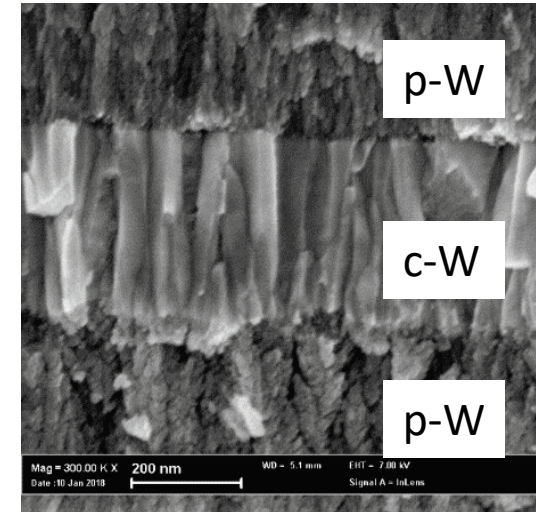
Samples for SP X.2

- Ready to produce compact W samples using HiPIMS for:
 - Characterization (SP B.3, SP B.4)
 - LIBS (SP X.2)
 - Exposure in linear machines (SP B.1)

Foreseen within May 2022

- W+N+O layered samples produced with PLD for:
 - Characterization (SP B.4)

Foreseen within July 2022



Future samples



Samples for SP B.1

- Production of W-coatings, for GyM exposures, on:
 - Flat and pyramidal-Si
 - Flat and rough graphite

Foreseen within April 2022

Samples for SP X.2

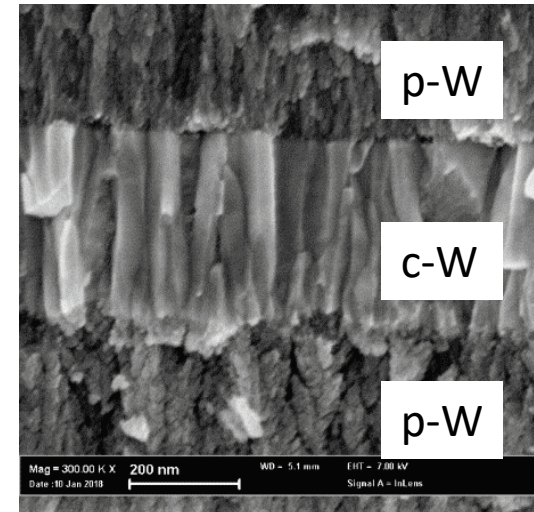
- Ready to produce compact W samples using HiPIMS for:
 - Characterization (SP B.3, SP B.4)
 - LIBS (SP X.2)
 - Exposure in linear machines (SP B.1)

Foreseen within May 2022

- W+N+O layered samples produced with PLD for:
 - Characterization (SP B.4)

Foreseen within July 2022

- Samples availability is affected by the substrate preparation (cutting, polishing, etc.) or procurement (e.g., Mo substrates with PSI-2 geometry)
- A proper timing, in connection with the actual needs of the users (with well identified reference person), would allow a more effective samples production scheduling. Let's stay connected!



Thank you!