

WP PWIE kick-off meeting, 2026

SP B.3 Production of W and B reference layers

D. Dellasega, G. Alberti, D. Vavassori, F. Gaspari, E. Vassallo, M. Pedroni, A. Uccello, M. Passoni

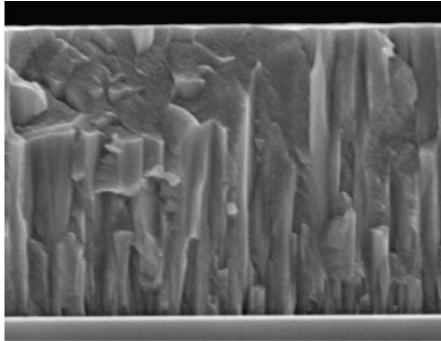
Politecnico di Milano – ENEA Milan



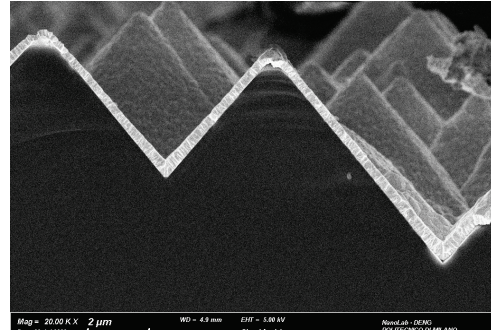
This work has been carried out within the framework of the EUROfusion Consortium, funded by the European Union via the Euratom Research and Training Programme (Grant Agreement No 101052200 – EUROfusion). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Commission. Neither the European Union nor the European Commission can be held responsible for them.



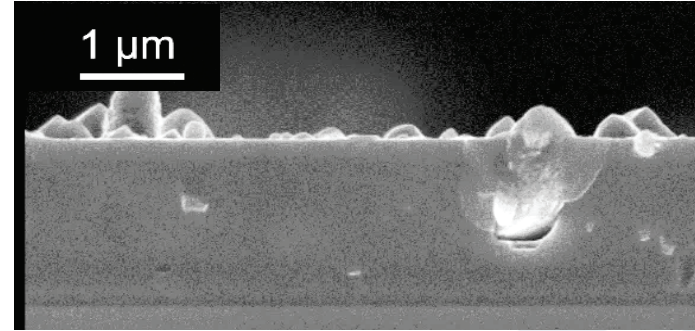
Compact W and B layers



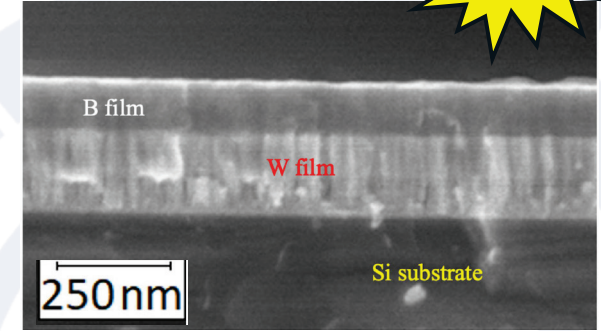
Compact-W



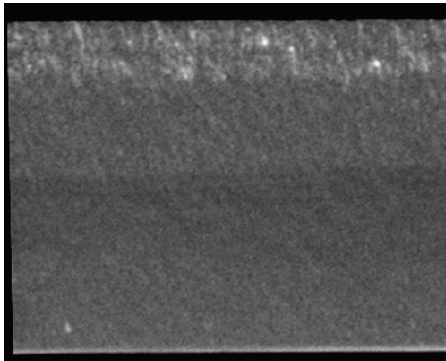
Non planar substr.



Compact-B



Compact-B/W multilayer [1]



Amorphous-W

Production: deposited with PLD, HiPIMS and **RF-MS** (ISTP Milan)

Uniformity: on a 30 mm width nominal thickness $\pm 7\%$

Thickness: from 50 nm up to

- 2000 nm PLD and HiPIMS
- 100 -200 nm RF-MS

Density:

- Compact B: 80% of bulk density
- Compact-W: 95%
- 63% a-W of bulk density

Structure (assessed by Raman and XRD analysis):

- Compact B is amorphous
- Compact W is nanocrystalline (110) main cryst. orientation
- Amorphous W is amorphous

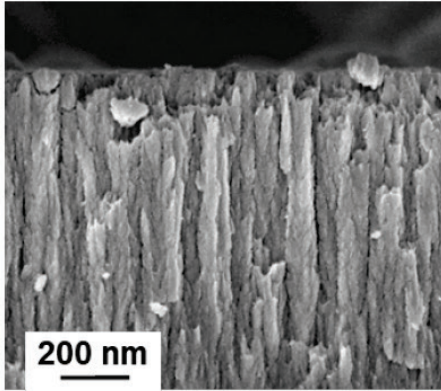
Oxygen content:

- Compact B: 11.7% (at.)
- Compact W: 0-12% (at.)

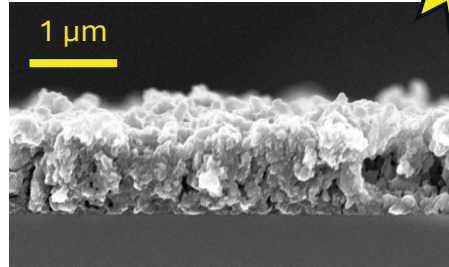
[1] E. Vassallo et al. *Surfaces* **2026**, 9(2), 31



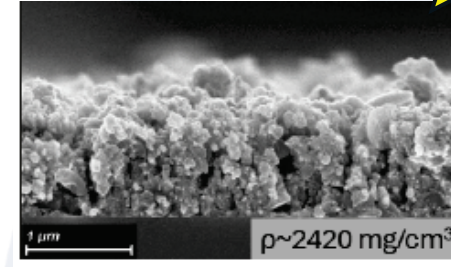
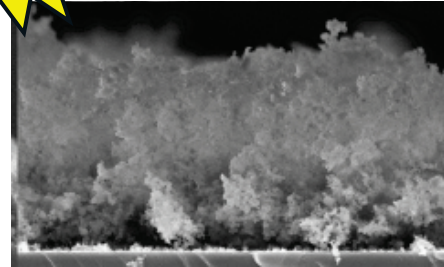
Porous and mixed B and W layers



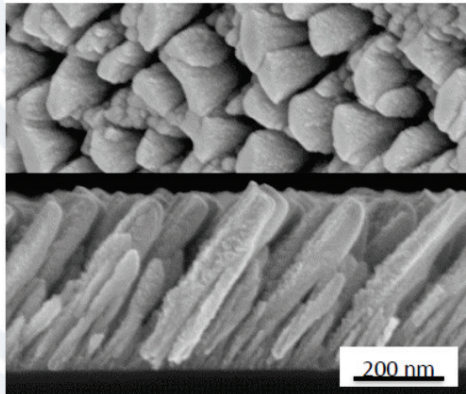
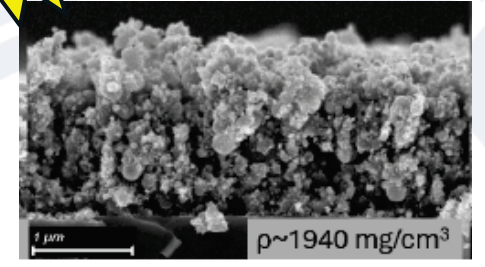
Porous-W



Porous-B



Porous-BW



Nanocolumnar-W

Production: deposited with ns-PLD, fs-PLD and DCMS

Morphology: Film porosity controlled using Ar pressure

Uniformity: on a 30 mm width nominal thickness $\pm 7\%$

Thickness: from 50 nm up to 3000 nm

Density:

- Porous W \rightarrow about 50% of bulk density
- Porous B \rightarrow from 45% up to 5% of bulk density

Oxygen content:

- Porous W: 50% (at.)
- Porous B: 3.4% (at.)

Structure (assessed by Raman and XRD):

- Porous B retains a small degree of crystallinity
- Porous W: is amorphous
- Nanocolumnar W: crystalline

BW composition

W content: 5 - 15 at%