

Diamond-Like Carbon layers for application in hydrogen sensor

Piotr Firek¹, Jan Szmidt¹, Mirosław Kozłowski², Elżbieta Czerwosz²

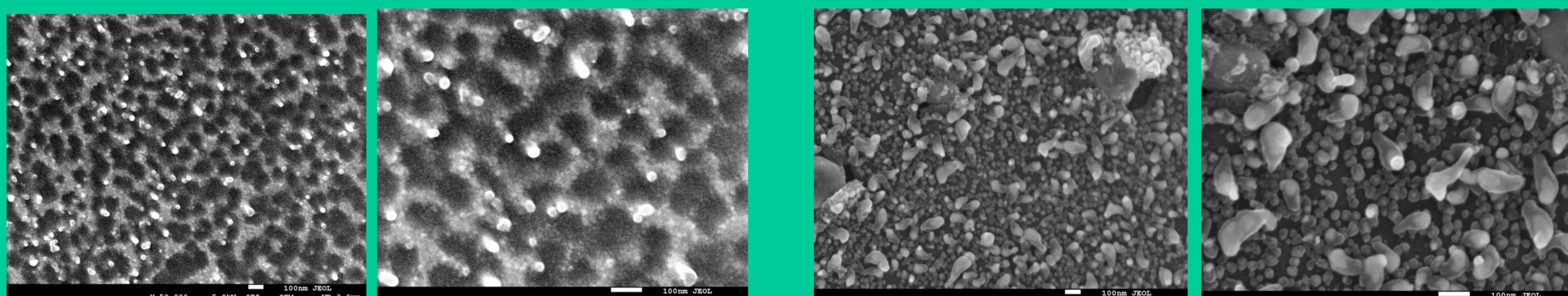
¹Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, Koszykowa 75, 00-662 Warsaw, Poland

²Tele & Radio Research Institute, Ratuszowa 11, 03-450 Warsaw, Poland

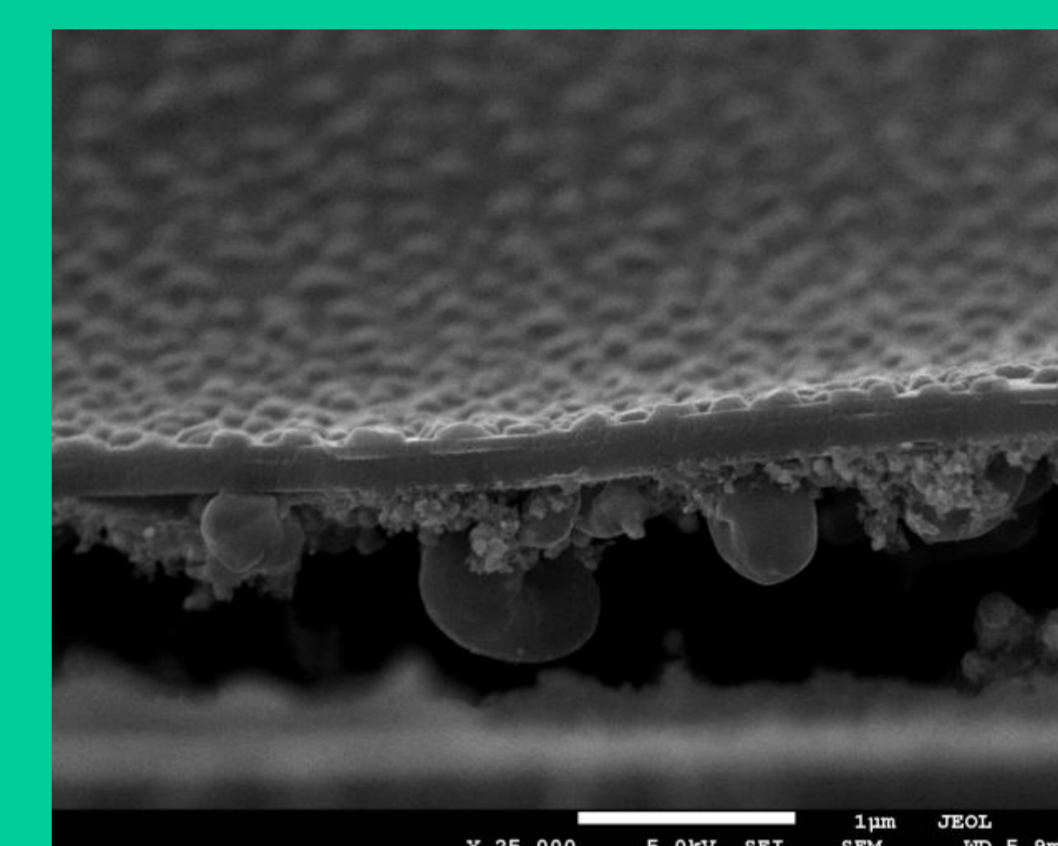
Films containing palladium can be applied in hydrogen and hydrogen compounds sensors. The size of palladium grains and their distribution on the film surface affect on the sensitivity of such film and their ability to hydrogen dissolution in palladium.

The palladium nano-grains film (nC-Pd film) was prepared in a following way: first diamond-like carbon (DLC) film was deposited on the different substrates (Si, porous Si, Al₂O₃) by radio frequency plasma assisted chemical vapor deposition method (RF PACVD); then physical vapor deposition (PVD) process was applied to obtain nanocomposite carbonaceous film (NC film) with palladium nanocrystals dispersed in all the volume of film; at last chemical vapor deposition (CVD) method in assistance of xylene and argon at the temperature 650°C was used for obtaining nC-Pd film.

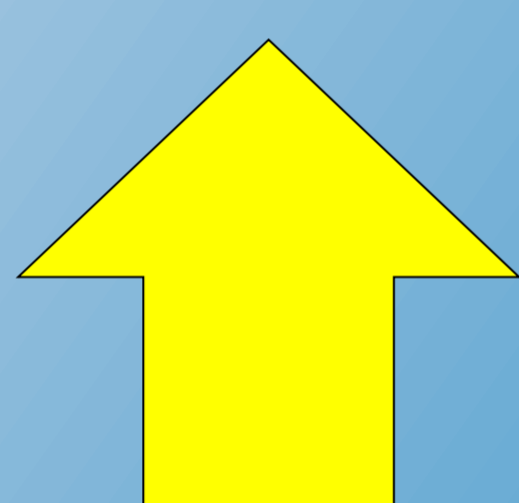
SEM images of microstructure of deposited layers



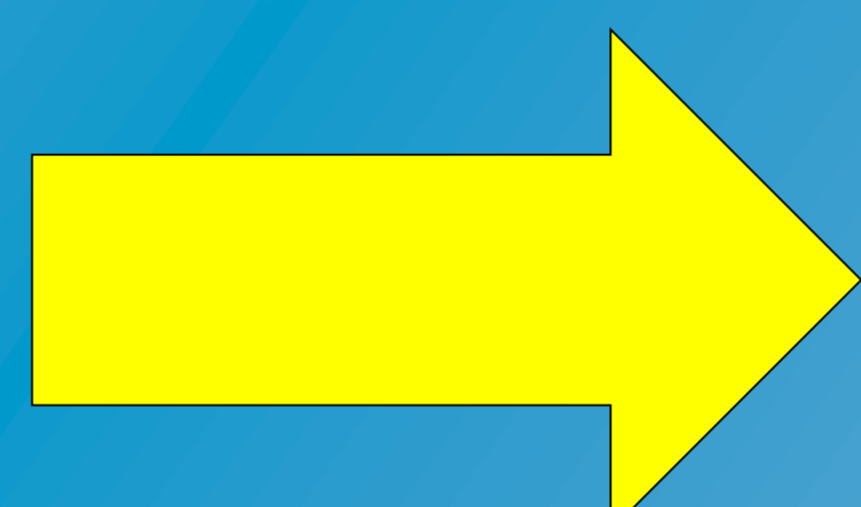
MOTIVATION



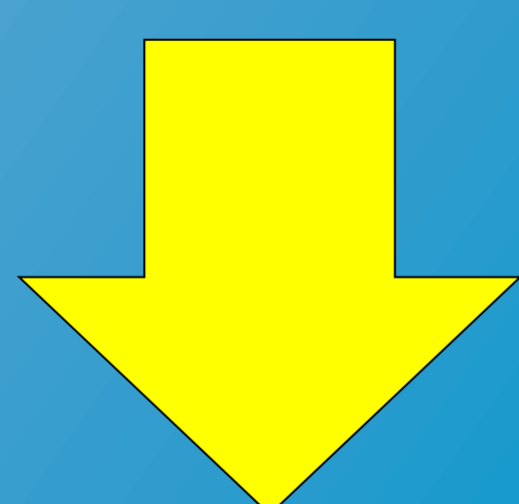
DLC on silicon



DLC on porous silicon

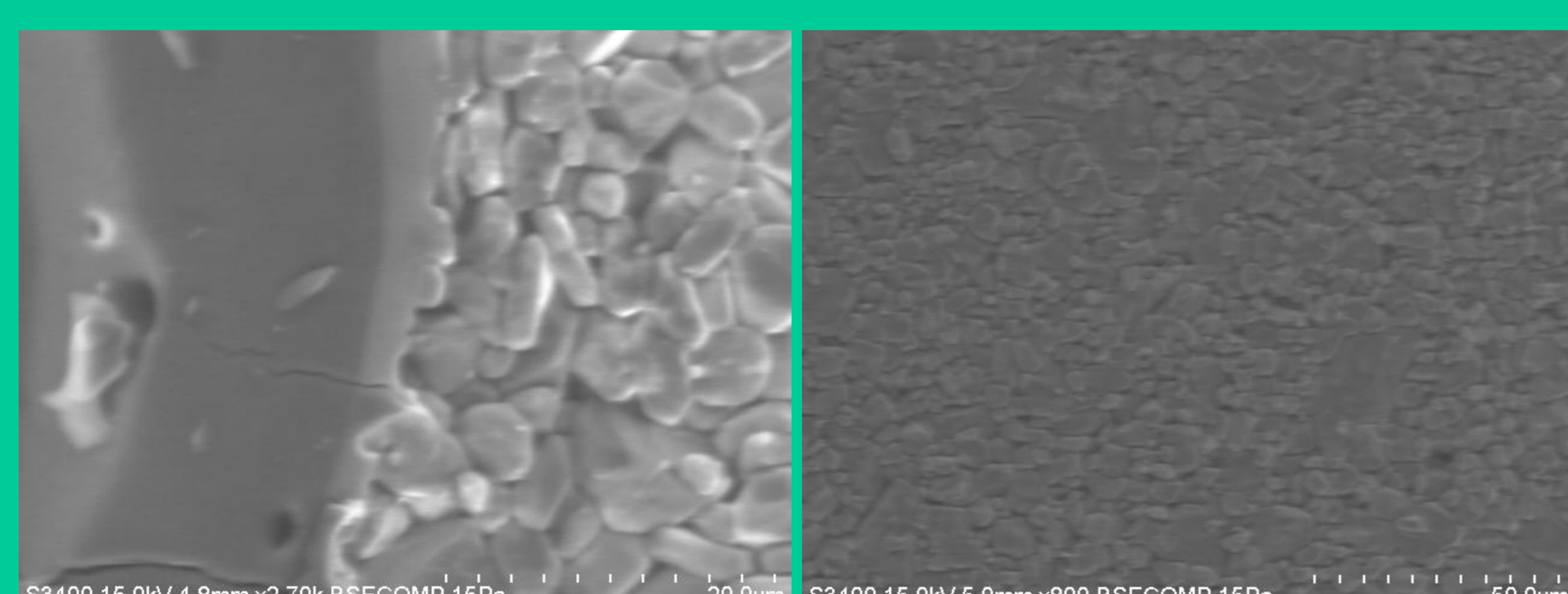
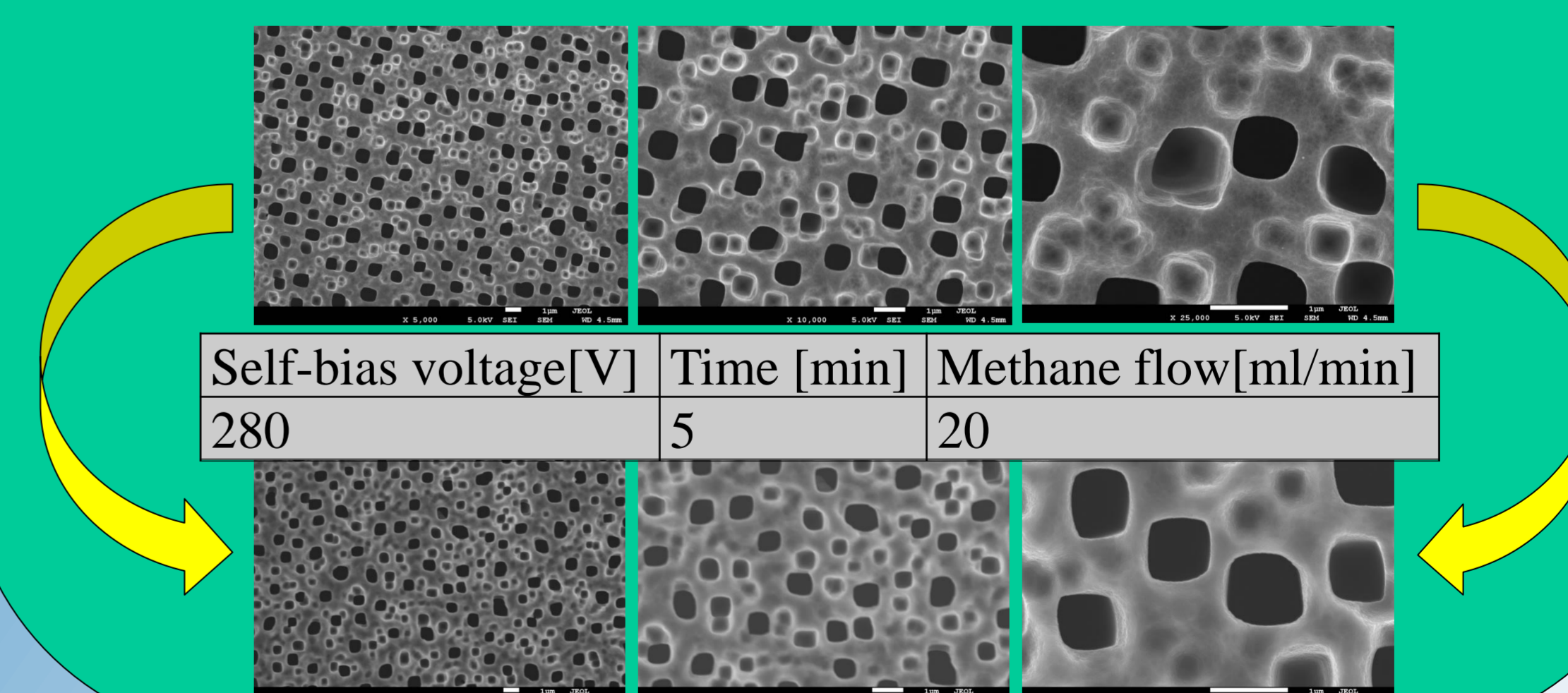
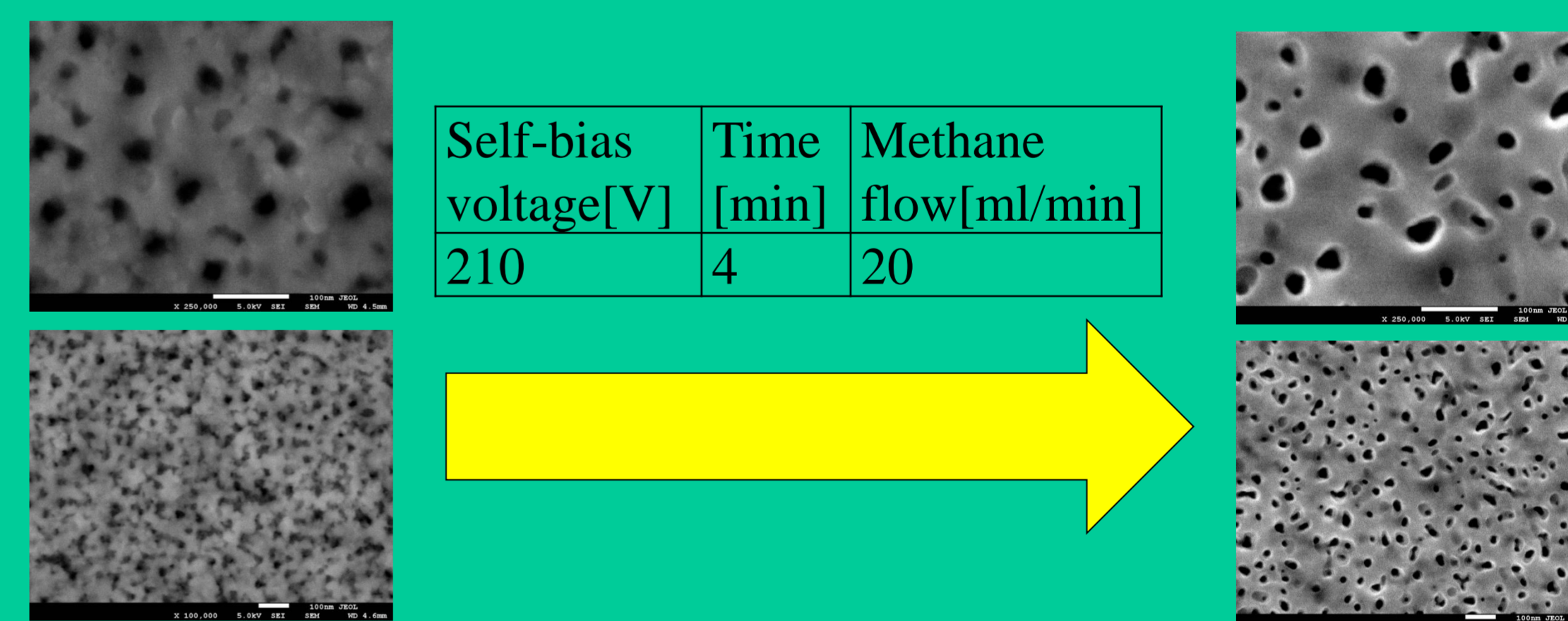
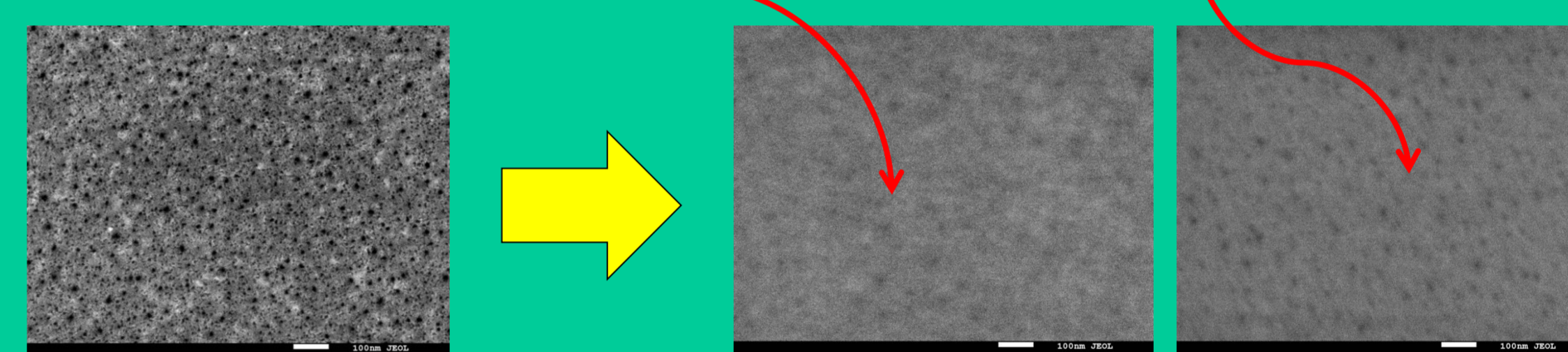


DLC on Al₂O₃ ceramic

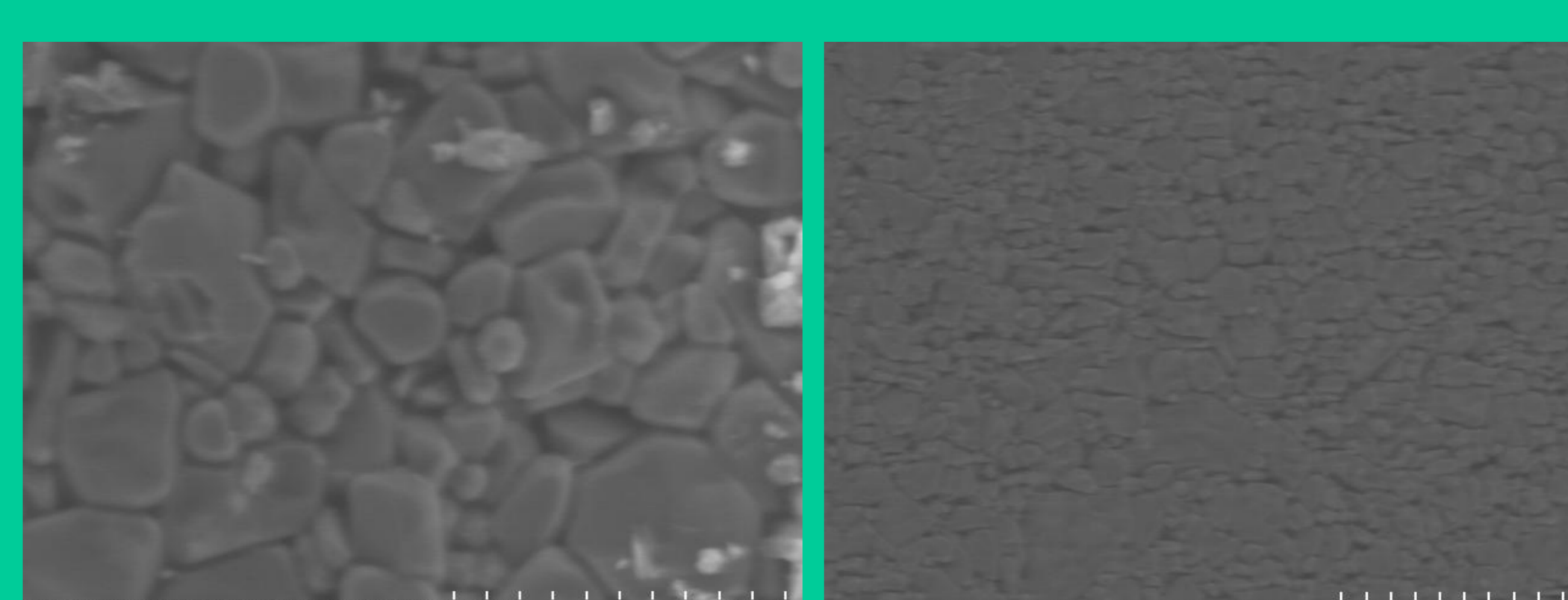
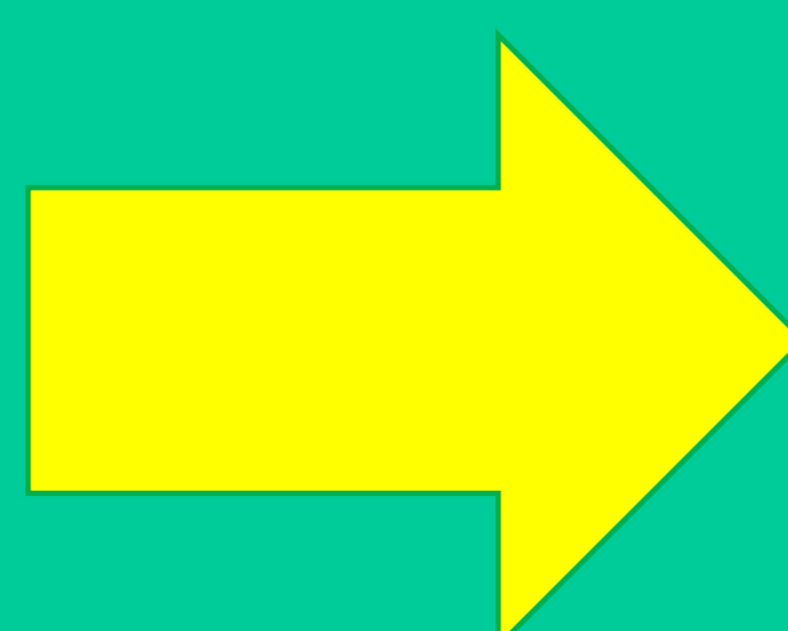


PVD/CVD nC- Pd FILM
DLC LAYER
SUBSTRATE

Sample	Self-bias voltage[V]	Time [min]	Methane flow[ml/min]
1	175	4	20
2	210	4	20
3	245	4	20
4	280	4	20



Substrate before deposition of DLC layer



Substrate after deposition of DLC layer