

# NANOMECHANICAL PROPERTIES OF C-PD FILMS

Joanna Rymarczyk<sup>1</sup>, Łukasz Kołodziejczyk<sup>2</sup>, Elżbieta Czerwosz<sup>1</sup>

<sup>1</sup> Tele & Radio Research Institute, Ratuszowa 11, 03-450 Warsaw, Poland

<sup>2</sup> Institute of Materials Science and Engineering, Lodz University of Technology, Stefanowskiego 1/15, 90-924 Łódź, Poland

Nanostructural carbonaceous films containing palladium nanograins (C-Pd films) are new nanocomposite materials with unique properties and structure in comparison with both: bulk palladium and carbonaceous macro-materials. These materials can be used in hydrogen/hydrogen compounds sensing applications, therefore cognition their mechanical properties such as nanohardness, the reduced modulus or delamination is particularly interesting.

C-Pd films were obtained by PVD method using as precursors: C<sub>60</sub> fullerenes and palladium acetate.

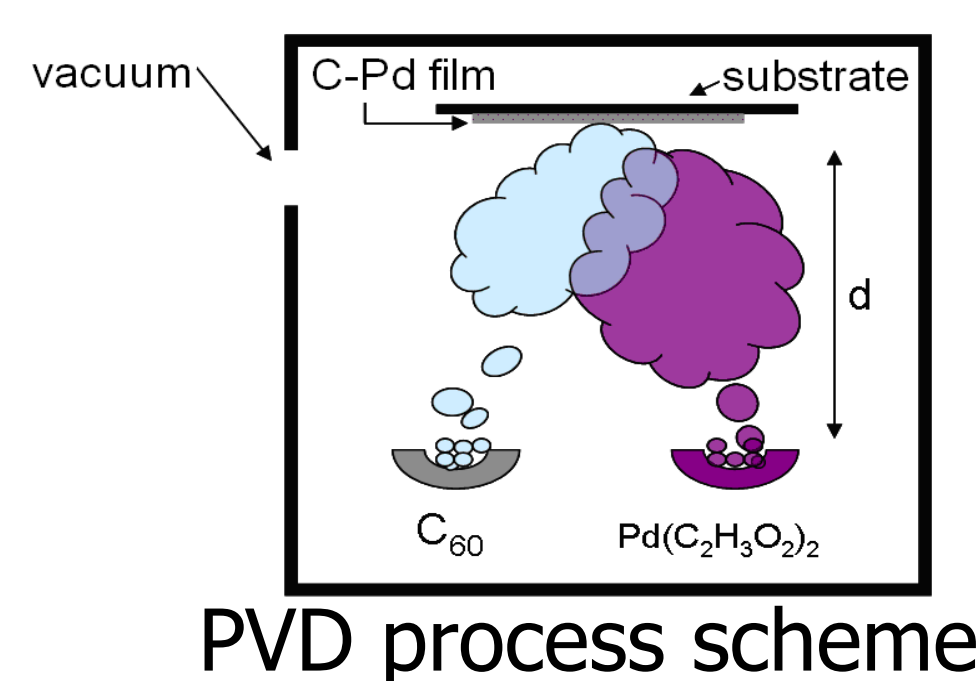
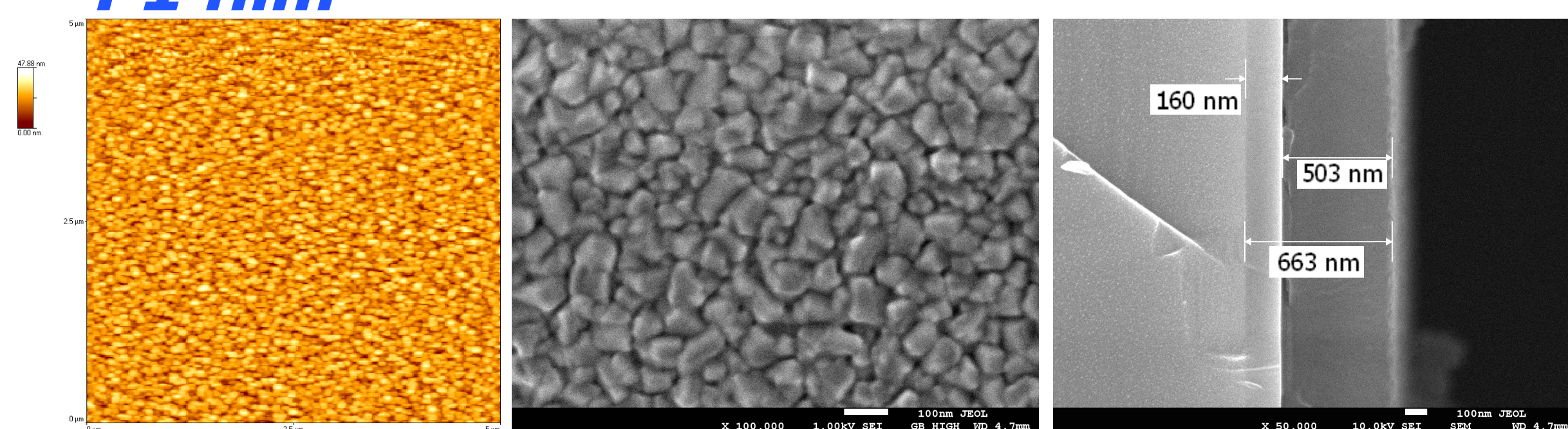


Table 1 Technological parameters of PVD processes

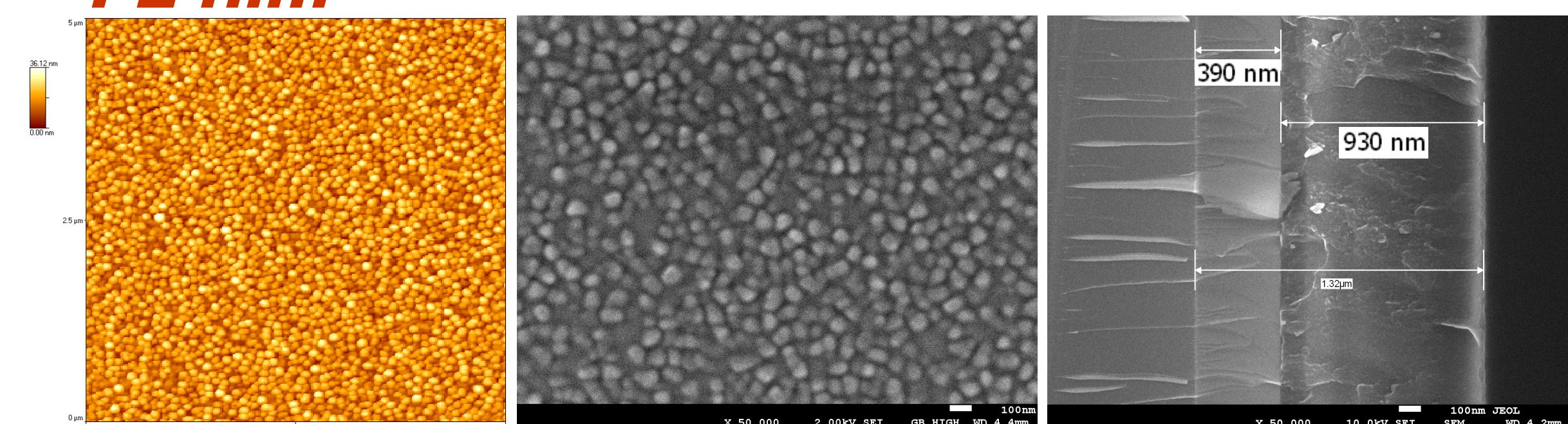
Sample	I <sub>C60</sub> [A]	I <sub>Pd</sub> [A]	t [min]	d [mm]	Substrate
P1	2.1	1.2	10	69	DLC/Si
P2	2.1	1.2	10	54	SiO <sub>2</sub> /Si
P3	2.1	1.1	8	69	SiO <sub>2</sub> /Si

## AFM and SEM results

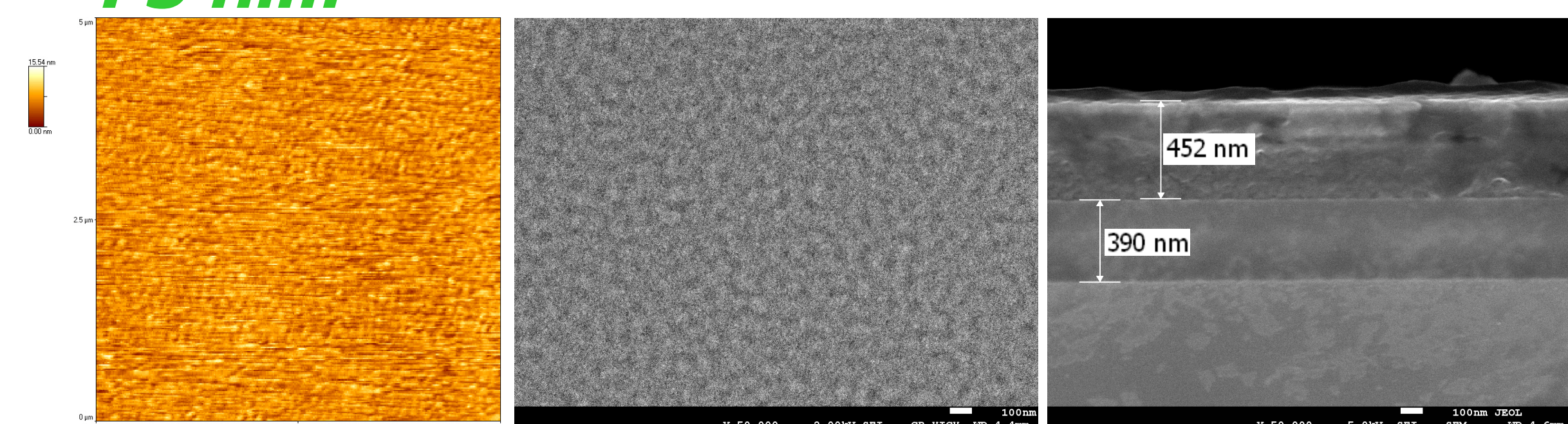
### P1 film



### P2 film



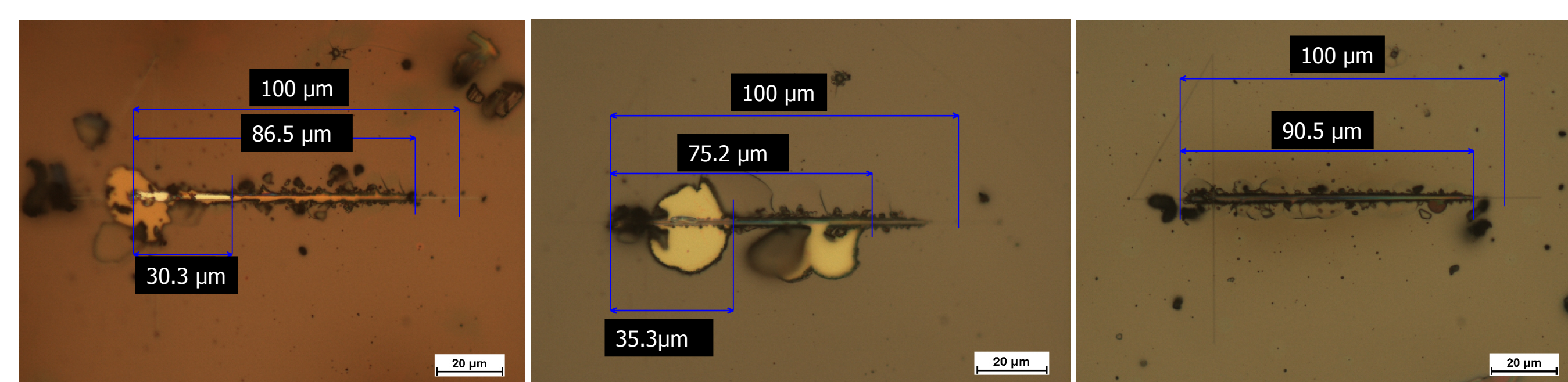
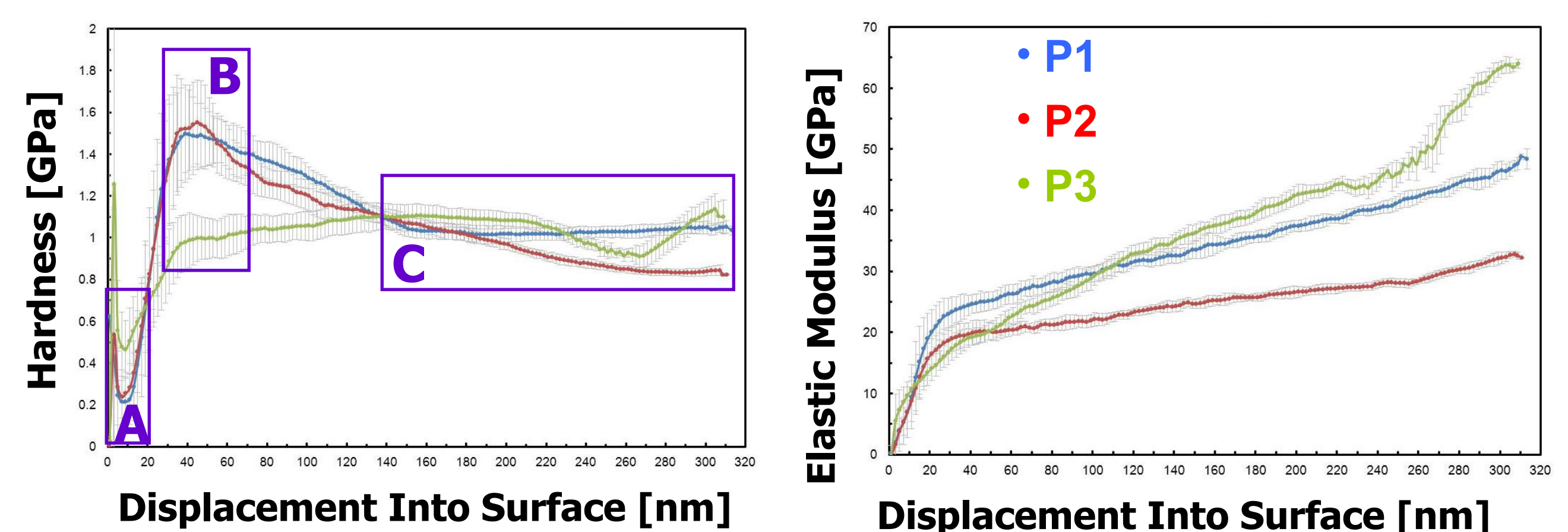
### P3 film



## Conclusion

Mechanical properties of carbon films containing Pd nanograins (C-Pd films) are substantially influenced by their microstructure, morphology and Pd content. It has also been recognized that parameters of technological process also have strong influence on the topography and thickness of these films.

## Nanoindentation results



Images of the scratch at C-Pd films

Table 2 AFM and SEM analysis

	Average roughness [nm]	Pd content [wt.%]	Thickness [nm]
P1	4.65	9.86	503
P2	4.47	8.37	930
P3	1.34	22.93	450

Table 3 Nanoscratch test results

	Critical Force [mN]	Standard deviation [mN]
P1	1.66	0.24
P2	4.18	0.55
P3	2.31	0.34

## Acknowledgment

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