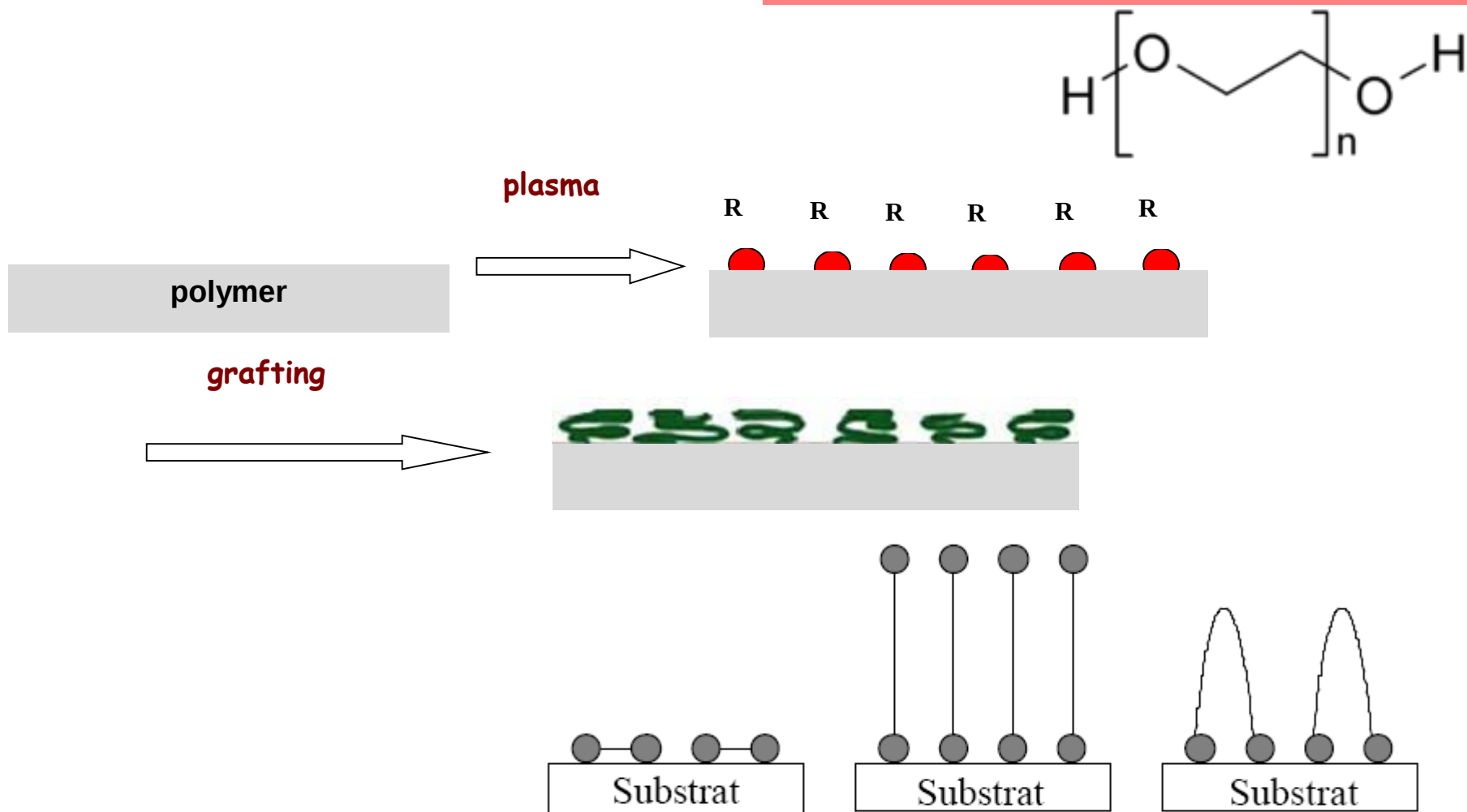
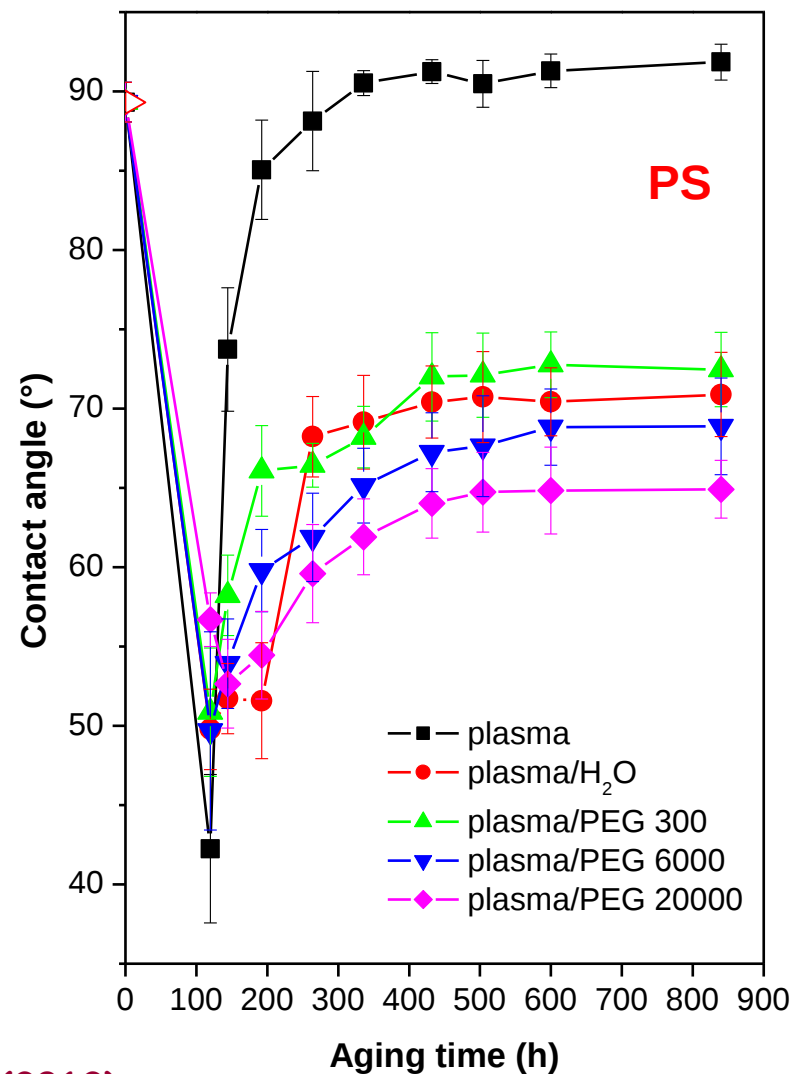
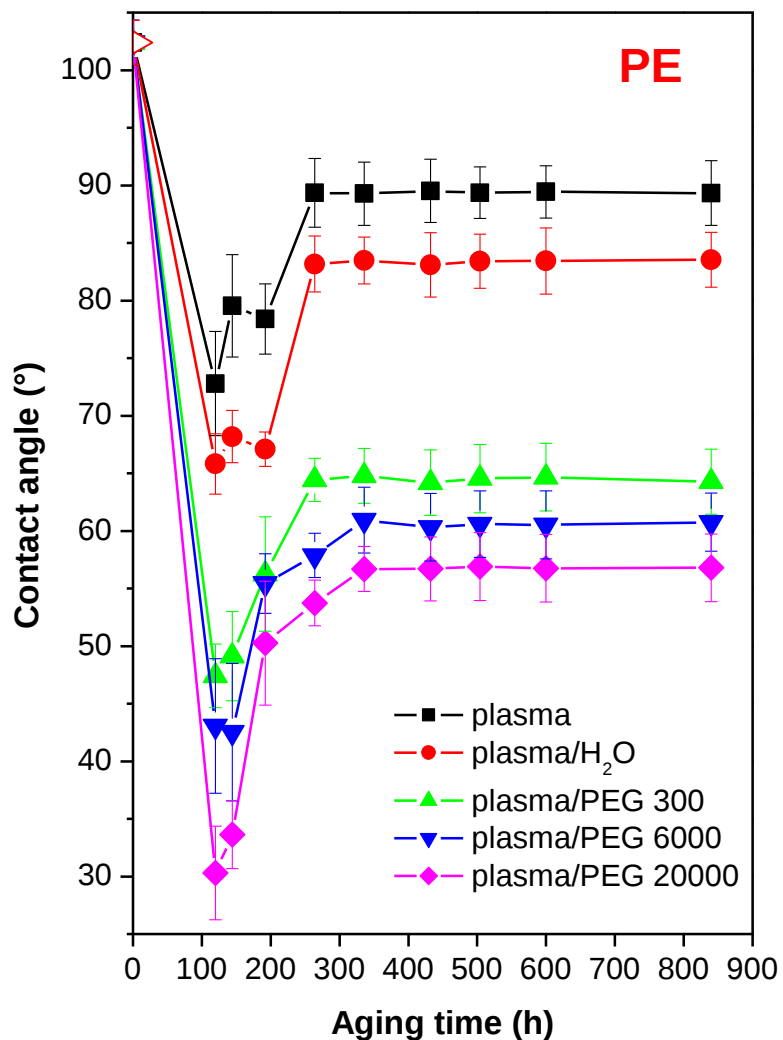
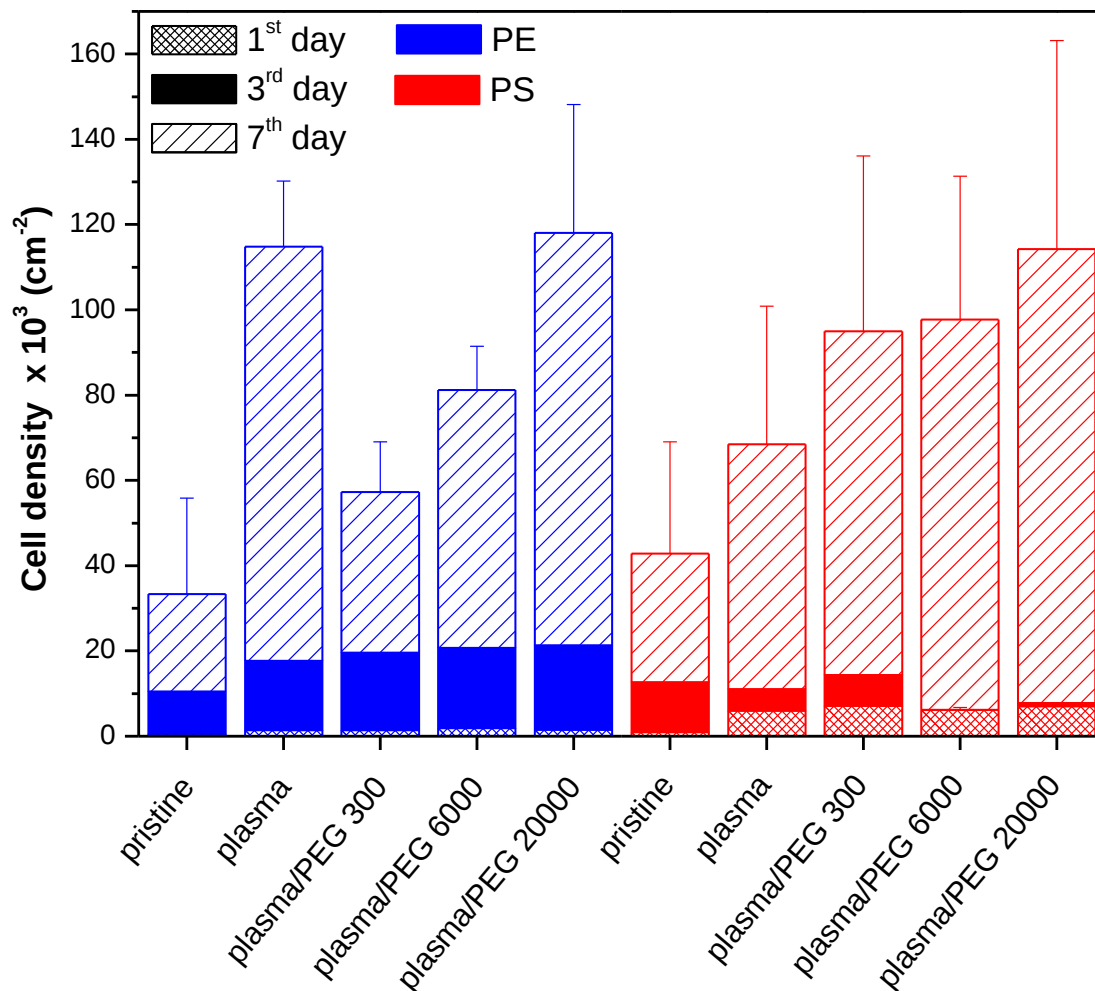


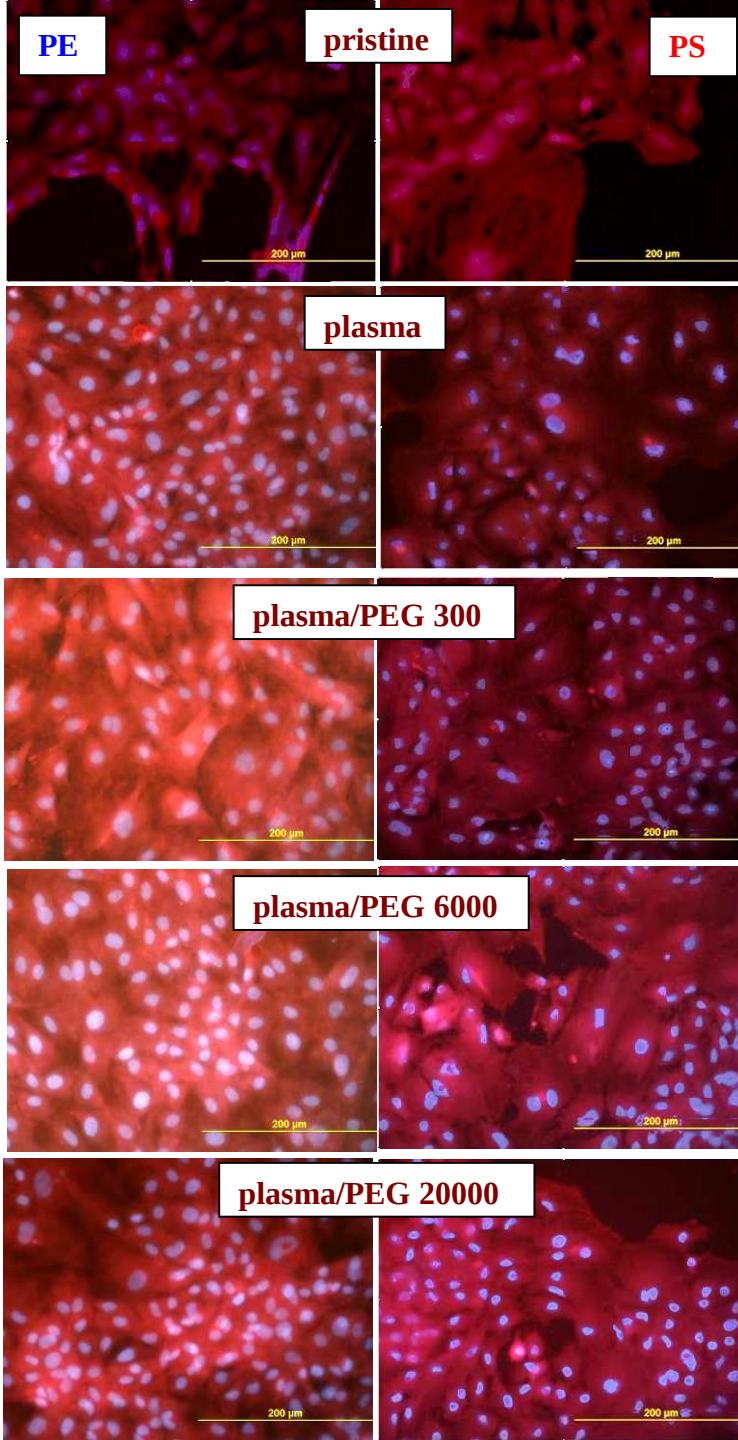
Roubování PEG na PE a PS

poly(ethylen glykol), polyethylenoxid,
poly(ethylenoxid), polyoxyethylen, PEG,
PEO, POE





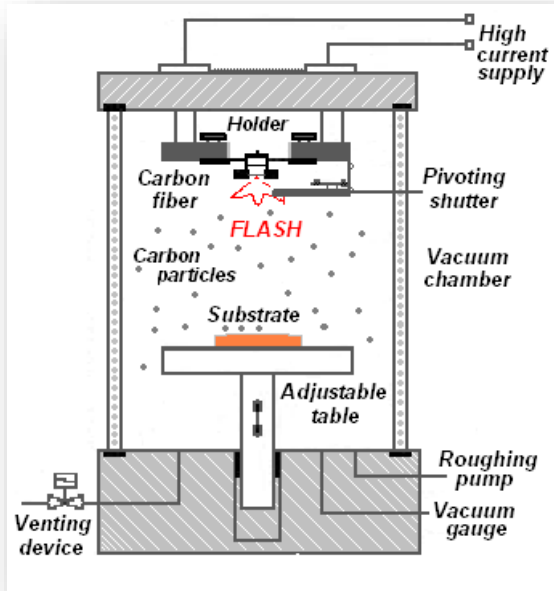




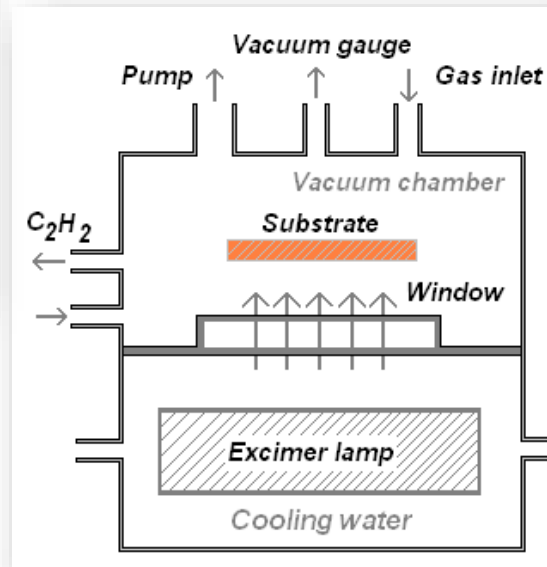
V.Švorčík, vaclav.svorcik@vscht.cz

V.Švorčík, Z.Makajová, N.Kasalková, Z.Kolská,
L.Bačáková, J. Nanosci. Nanotechnol. 12,
6665 (2012)

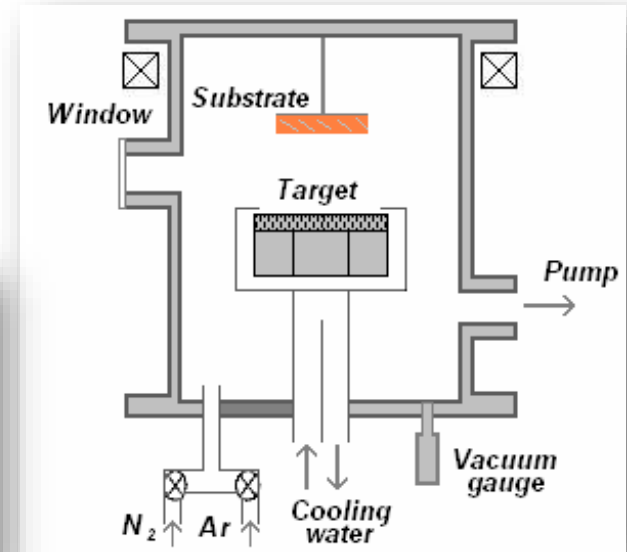
Methods used for production of thin carbon films



Evaporation from carbon fiber **EVAP**

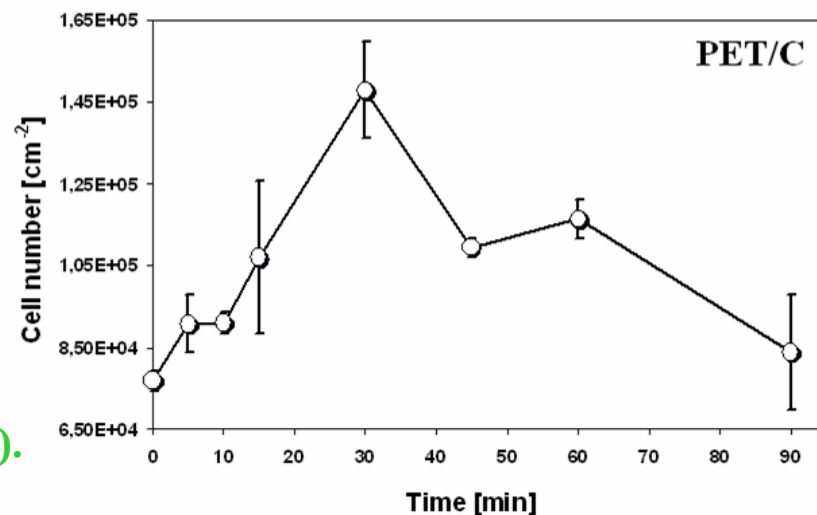
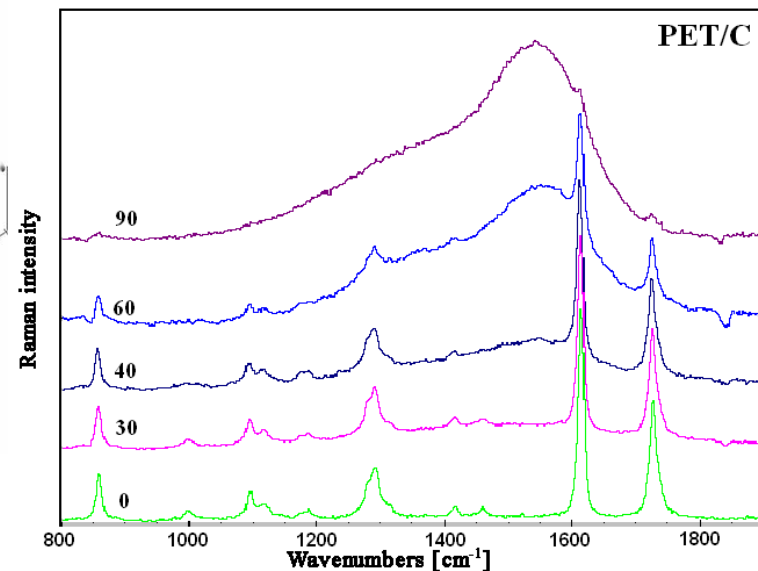
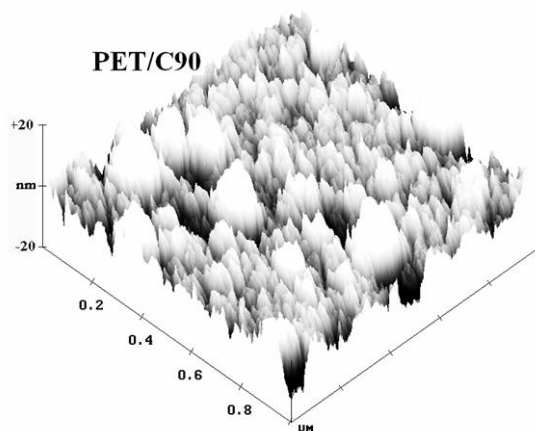
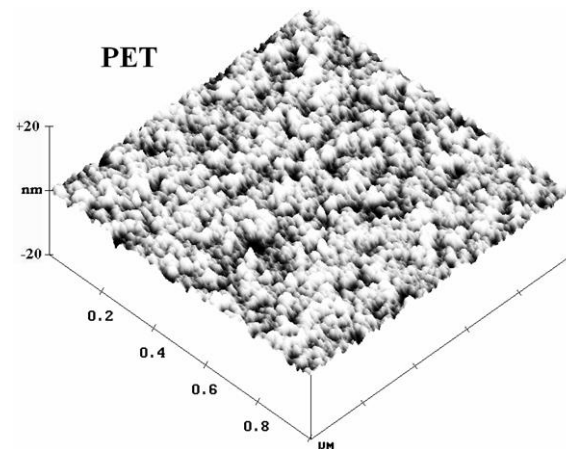
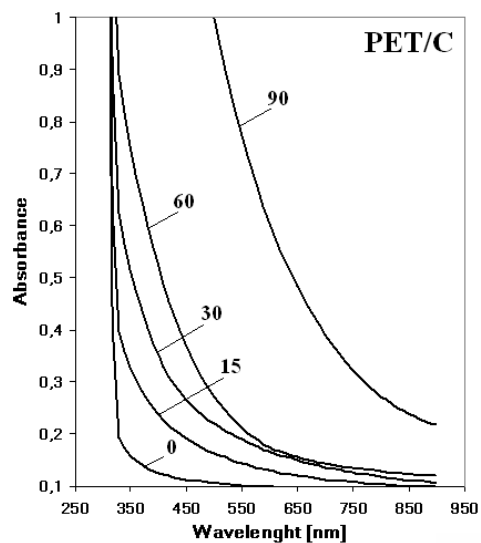


UV induced chemical vapor deposition **CVD**

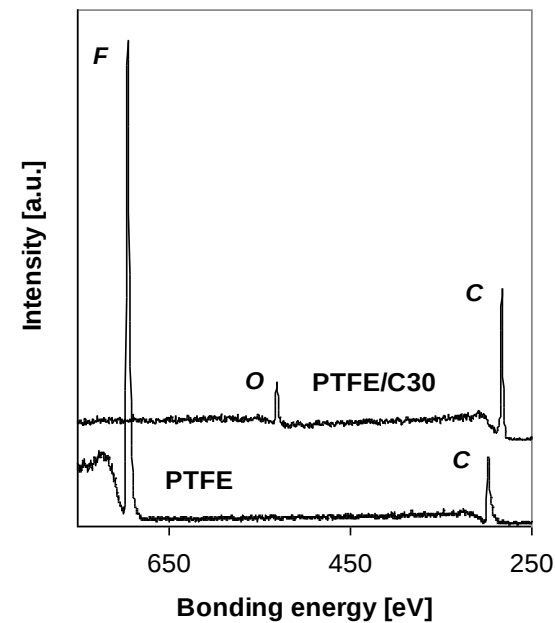
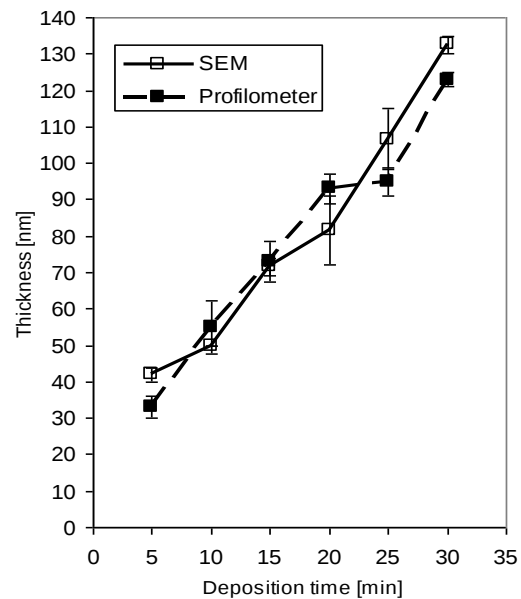
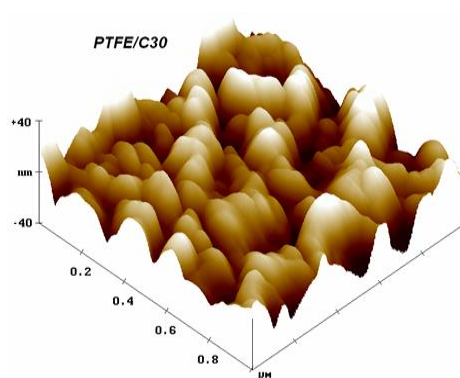
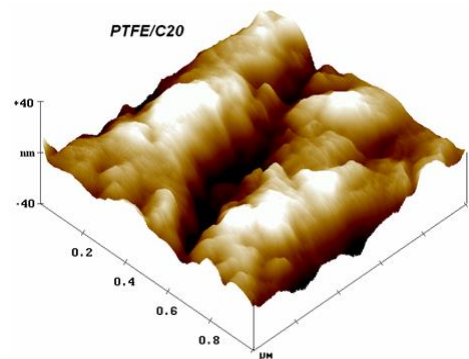
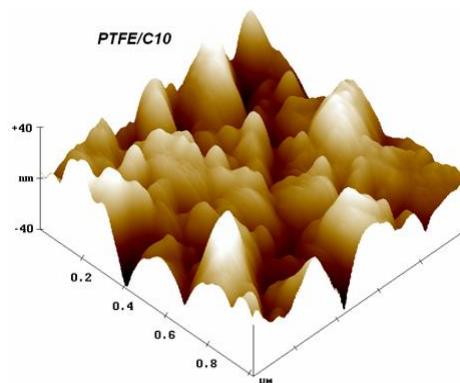
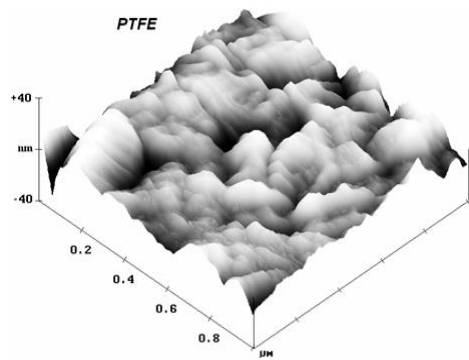


Magnetron sputtering **SPUT**

depozice C: naprašování, napařování a CVD metoda



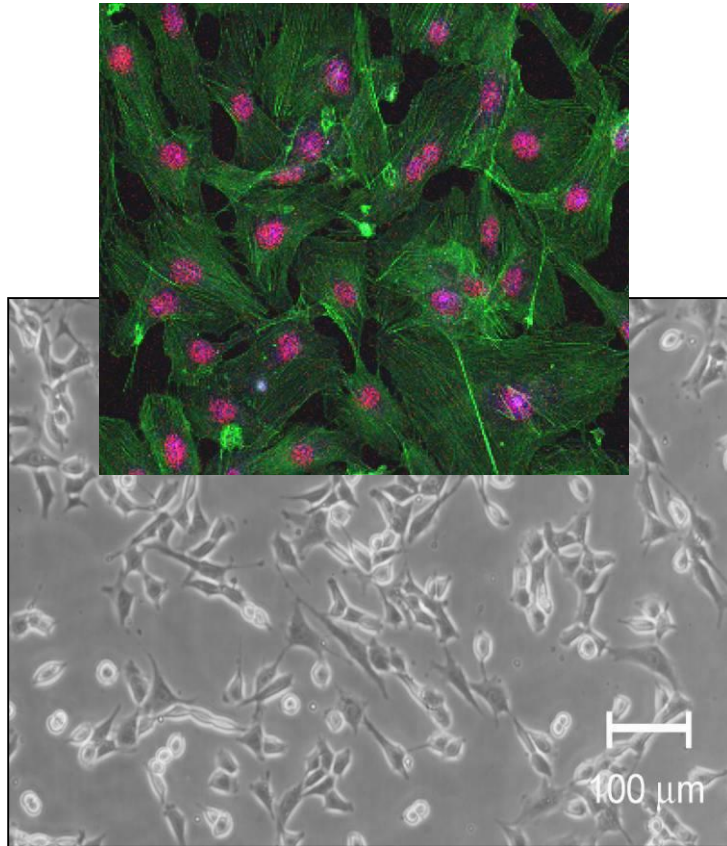
C/PTFE/Xe-lamp/acetylene



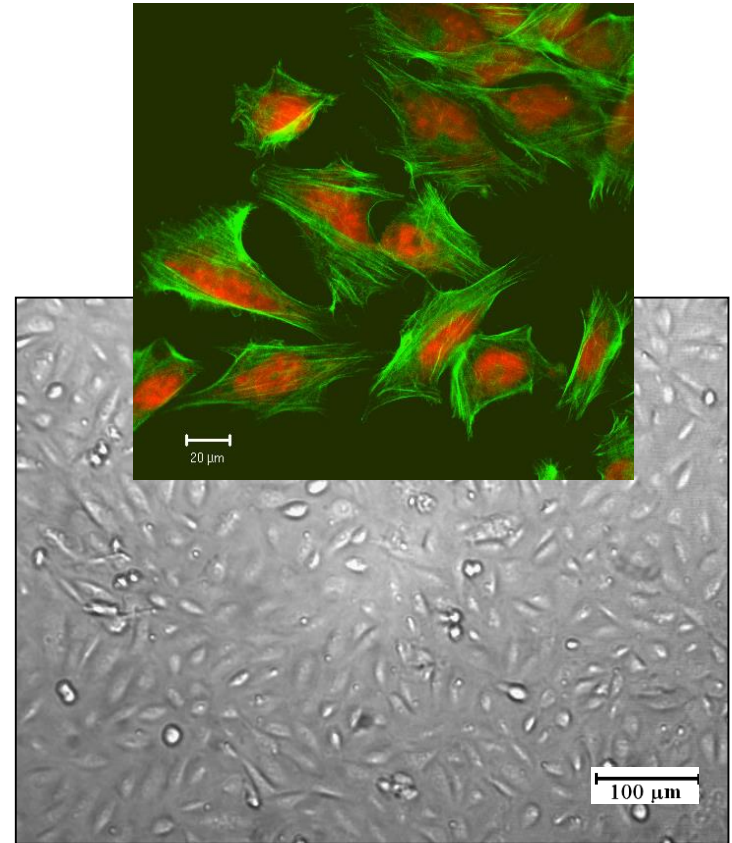
O.Kubová, V.Švorčík. et al., Thin Solid Films 515, 6765 (2007).

Cell interaction with carbon coatings *in vitro*

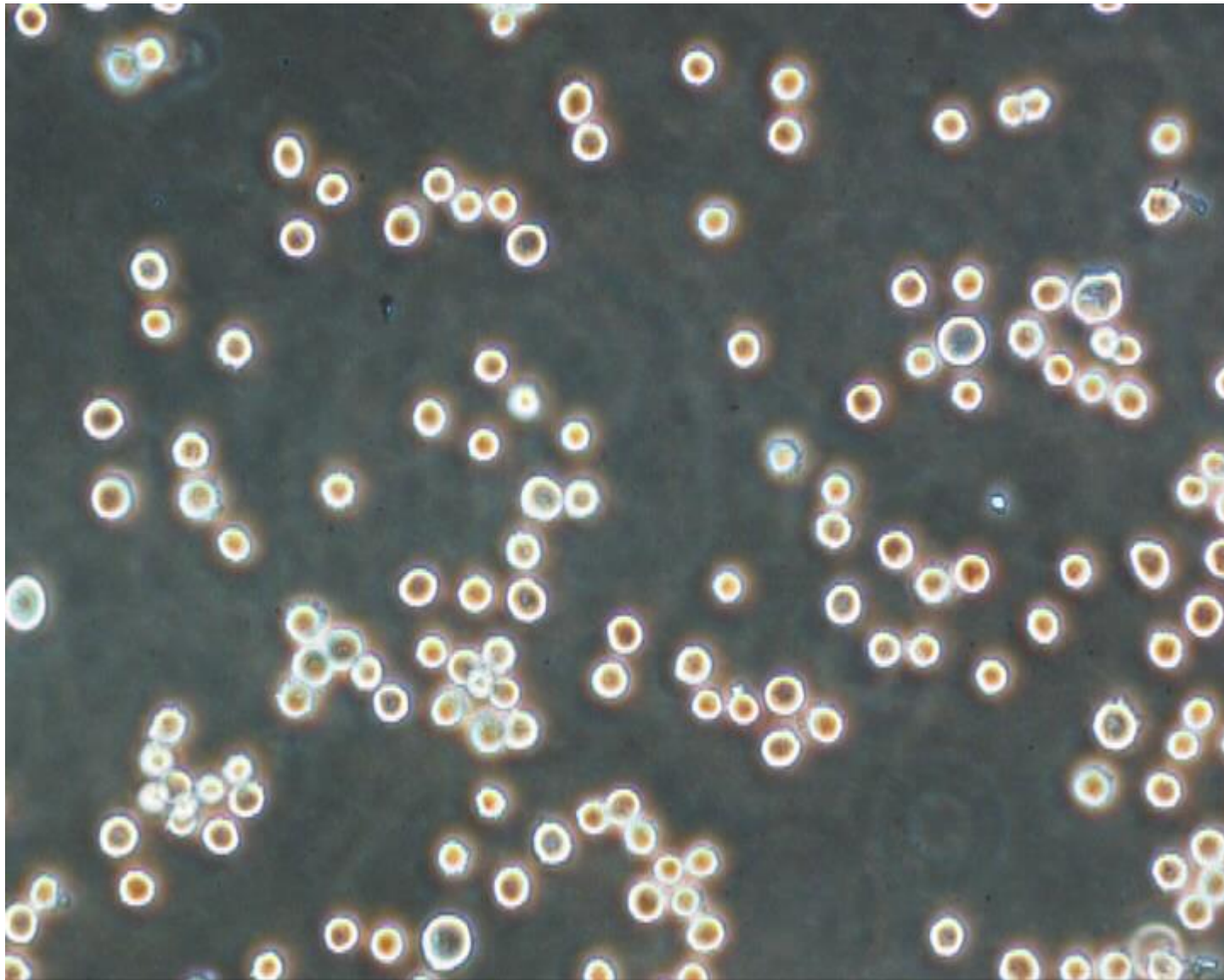
- mouse line 3T3 fibroblasts

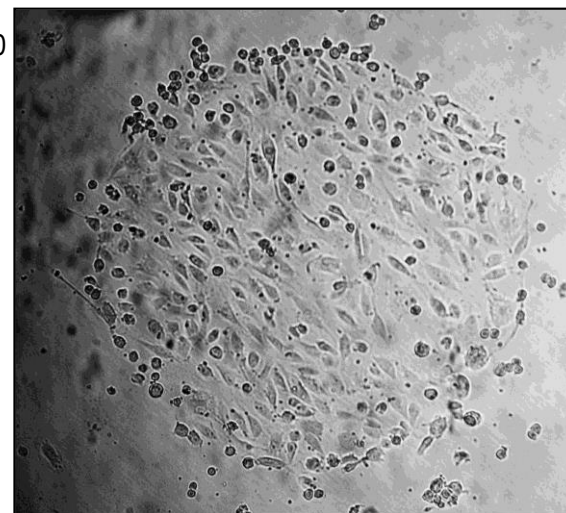
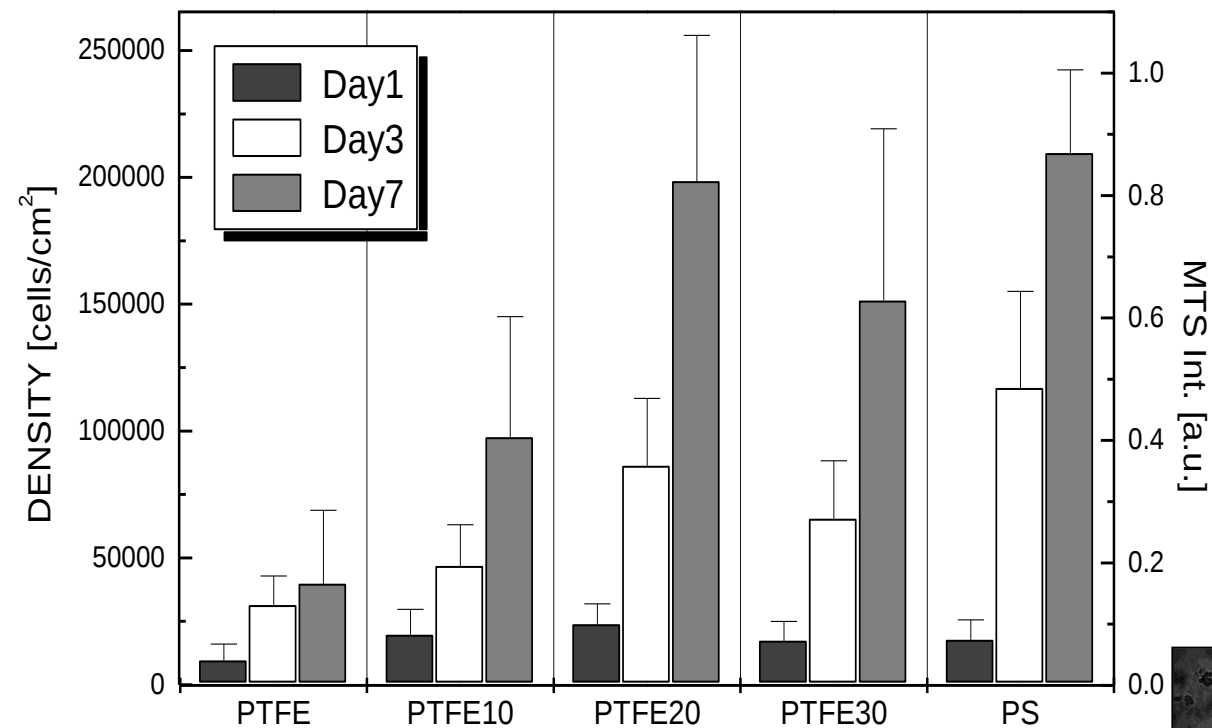


- endothelial (HUVEC) cells

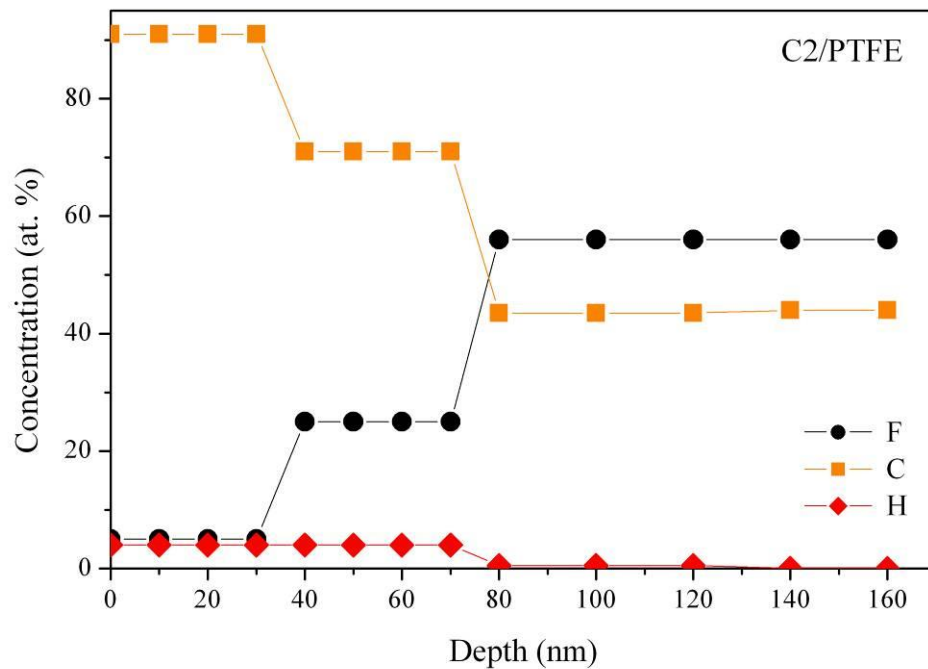
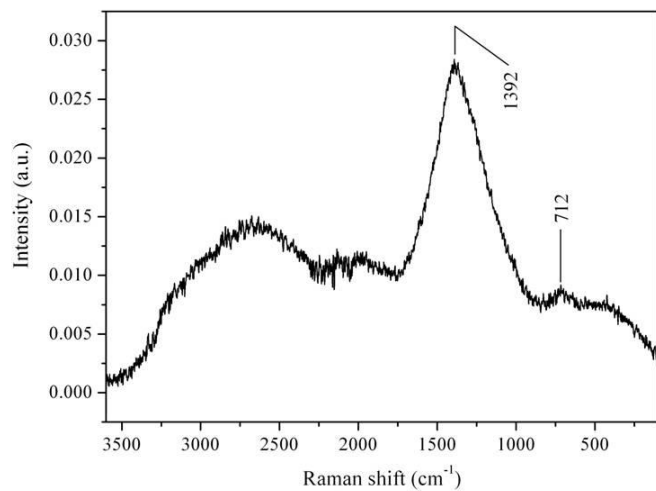
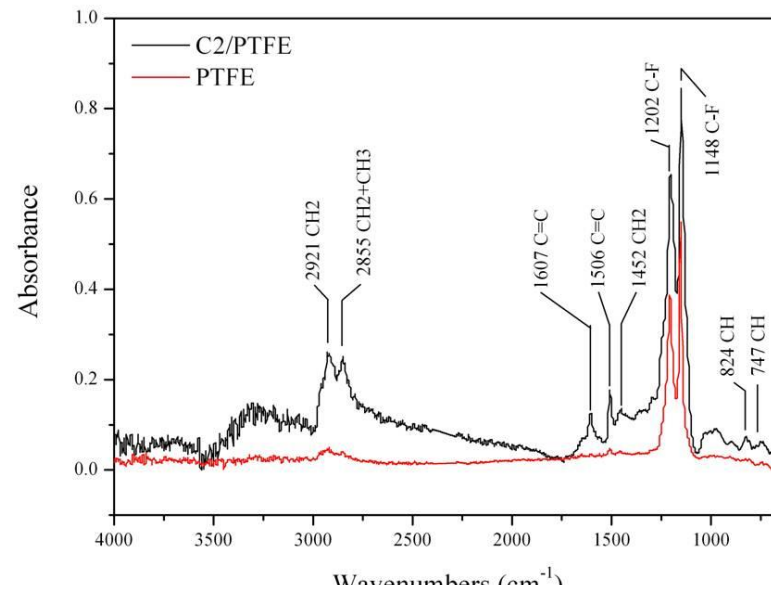
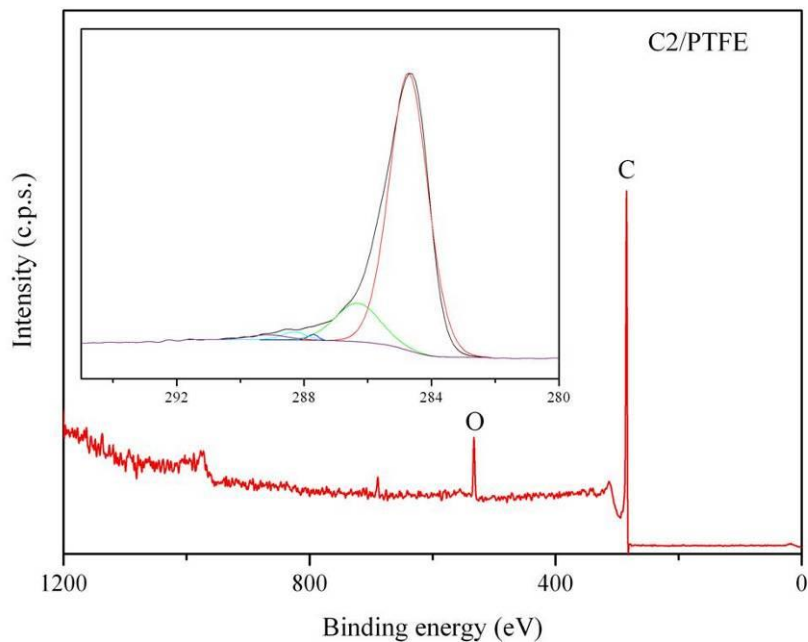


Osteoblasty (kostní buňky) na PS „za 33 hod“





O.Kubová, V.Švorčík. et al.,
Thin Solid Films 515, 6765 (2007).



V. Švorčík, T. Hubáček, P. Slepíčka, J. Siegel,
 Z. Kolská, O. Blahová, A. Macková,
 V. Hnatowicz, Carbon 47, 1770 (2009)

PET

$R_a=0.6$

PTFE

$R_a=13.3$

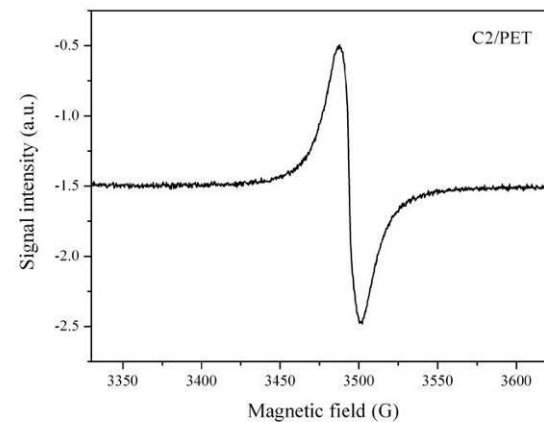
V.Švorčík, vaclav.svorcik@vscht.cz

C2/PET

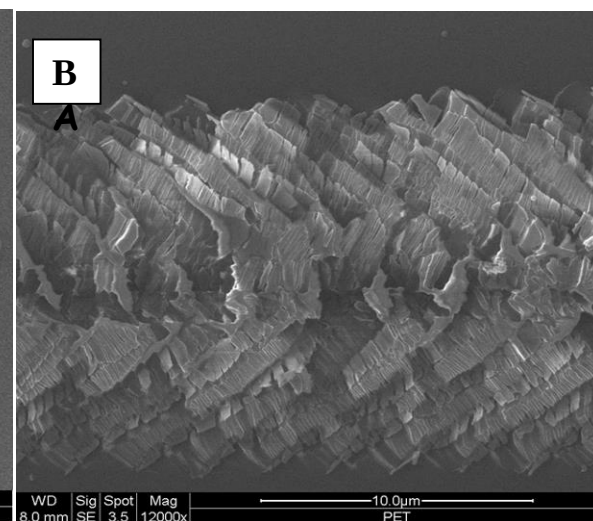
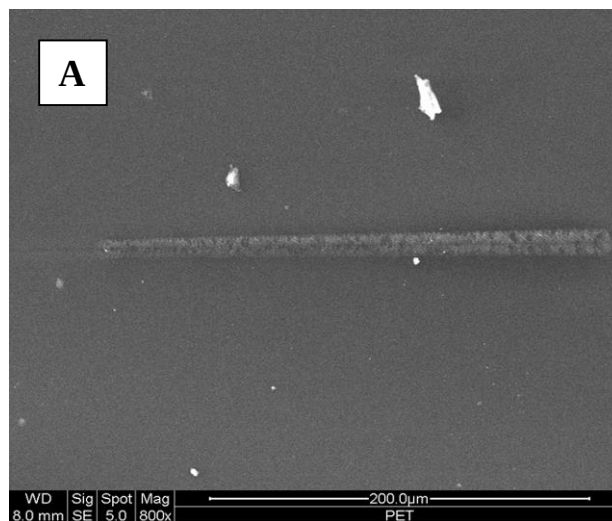
$R_a=0.5$

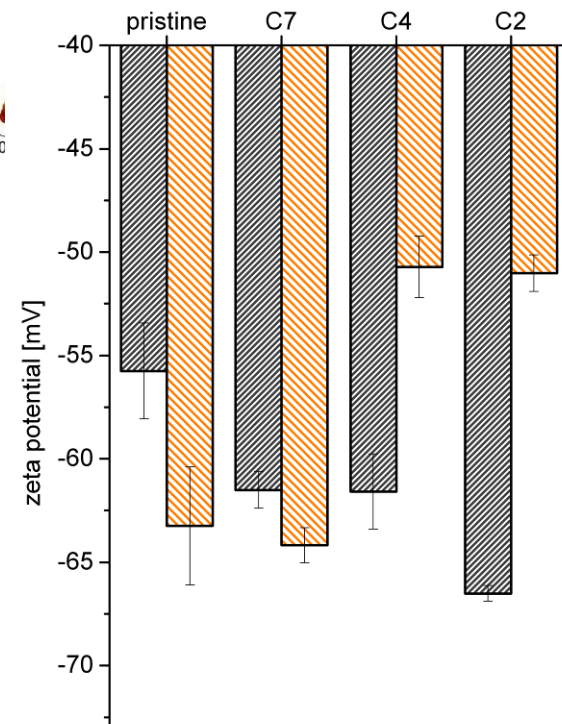
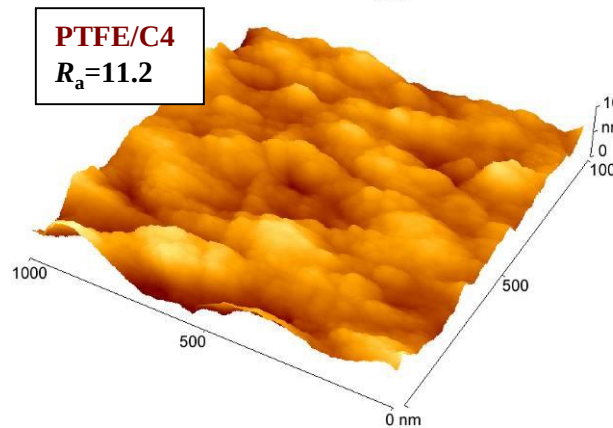
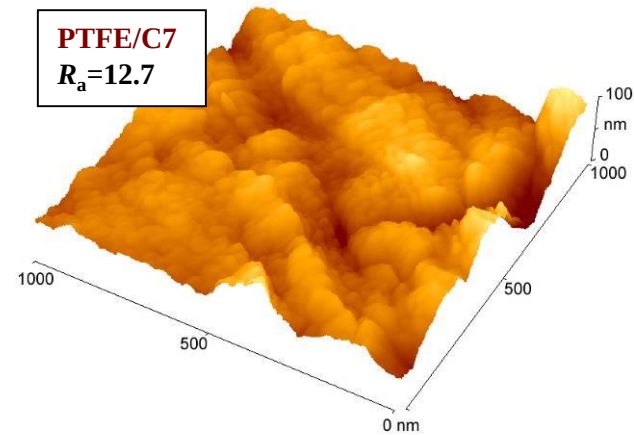
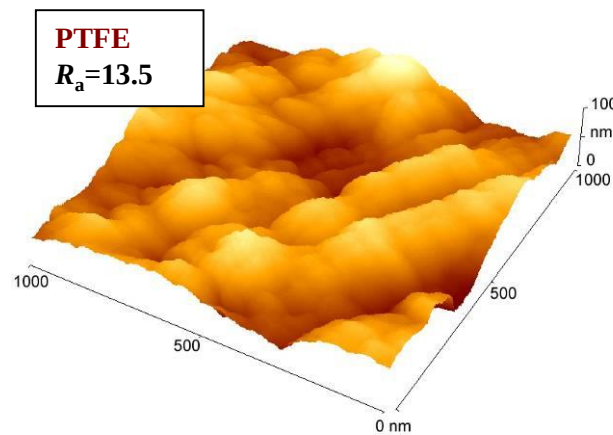
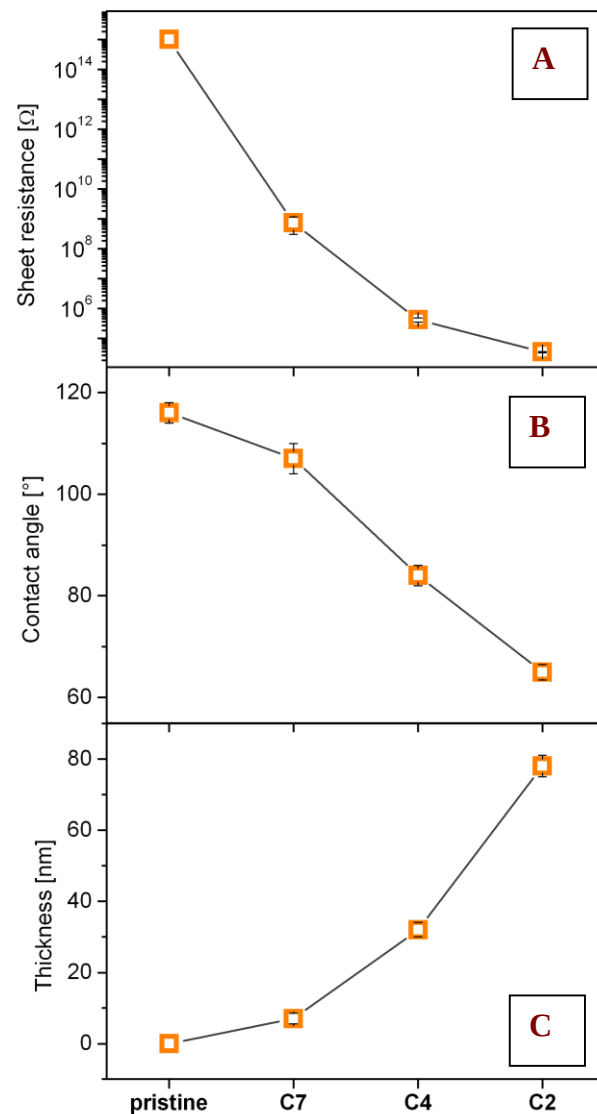
C2/PTFE

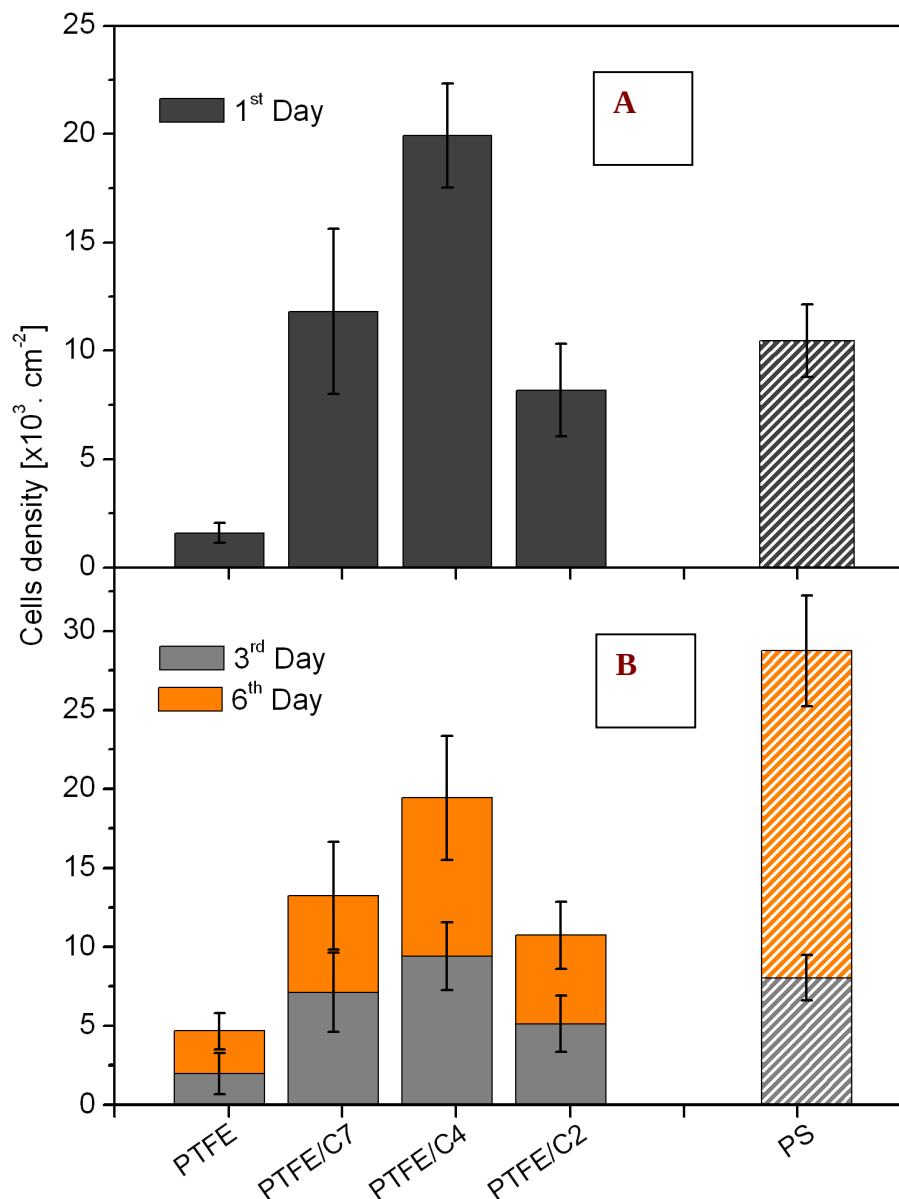
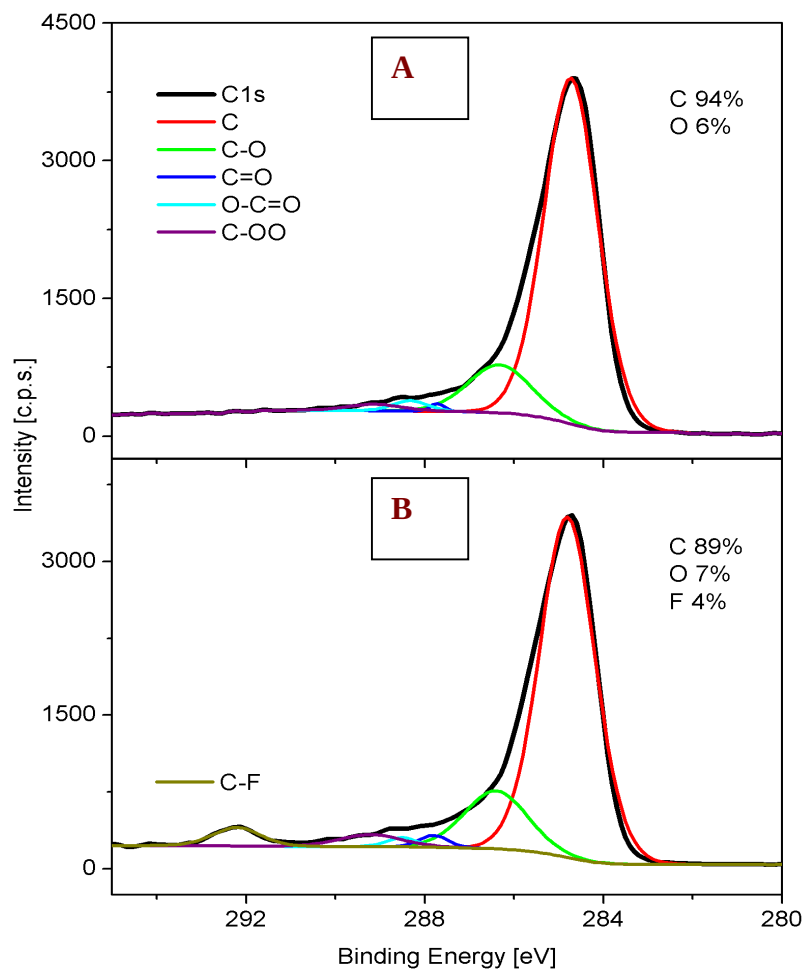
$R_a=2.9$



V.Švorčík, T.Hubáček,
P.Slepička, J.Siegel, Z.Kolská,
O.Blahová, A.Macková,
V.Hnatowicz, Carbon 47, 1770
(2009)

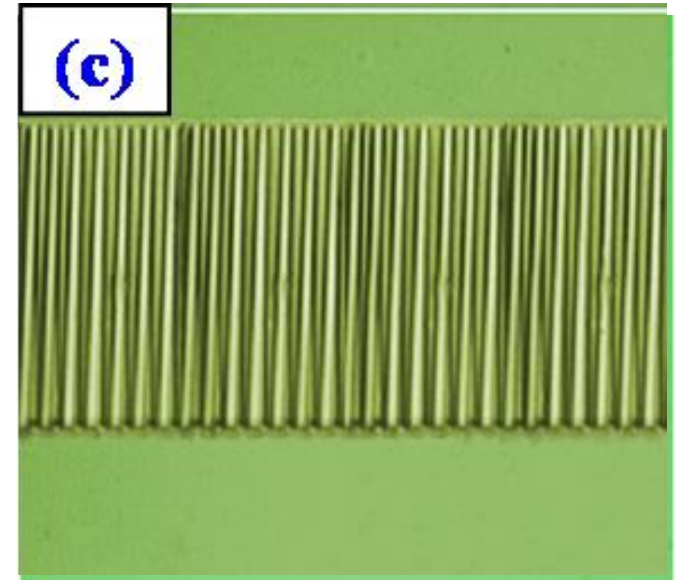
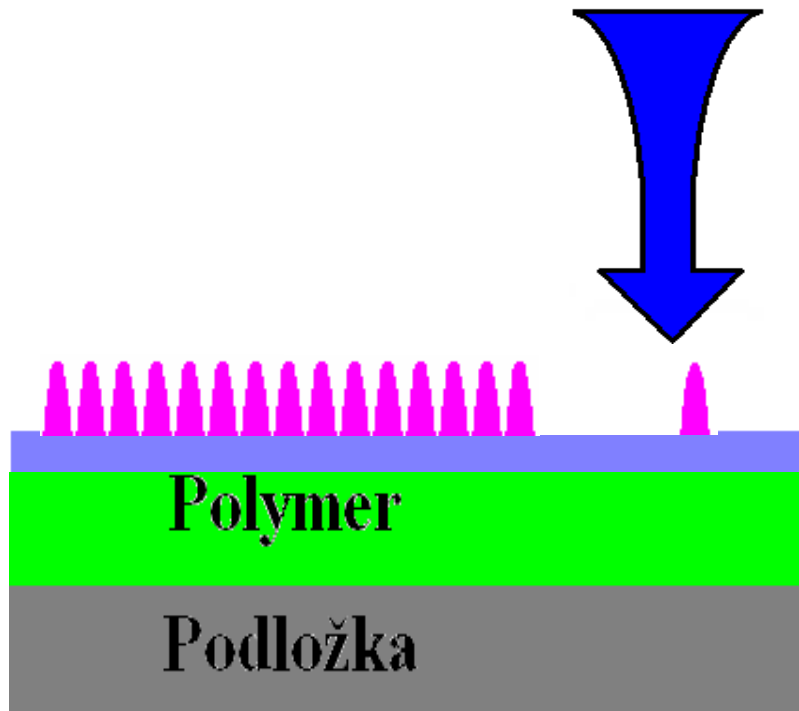


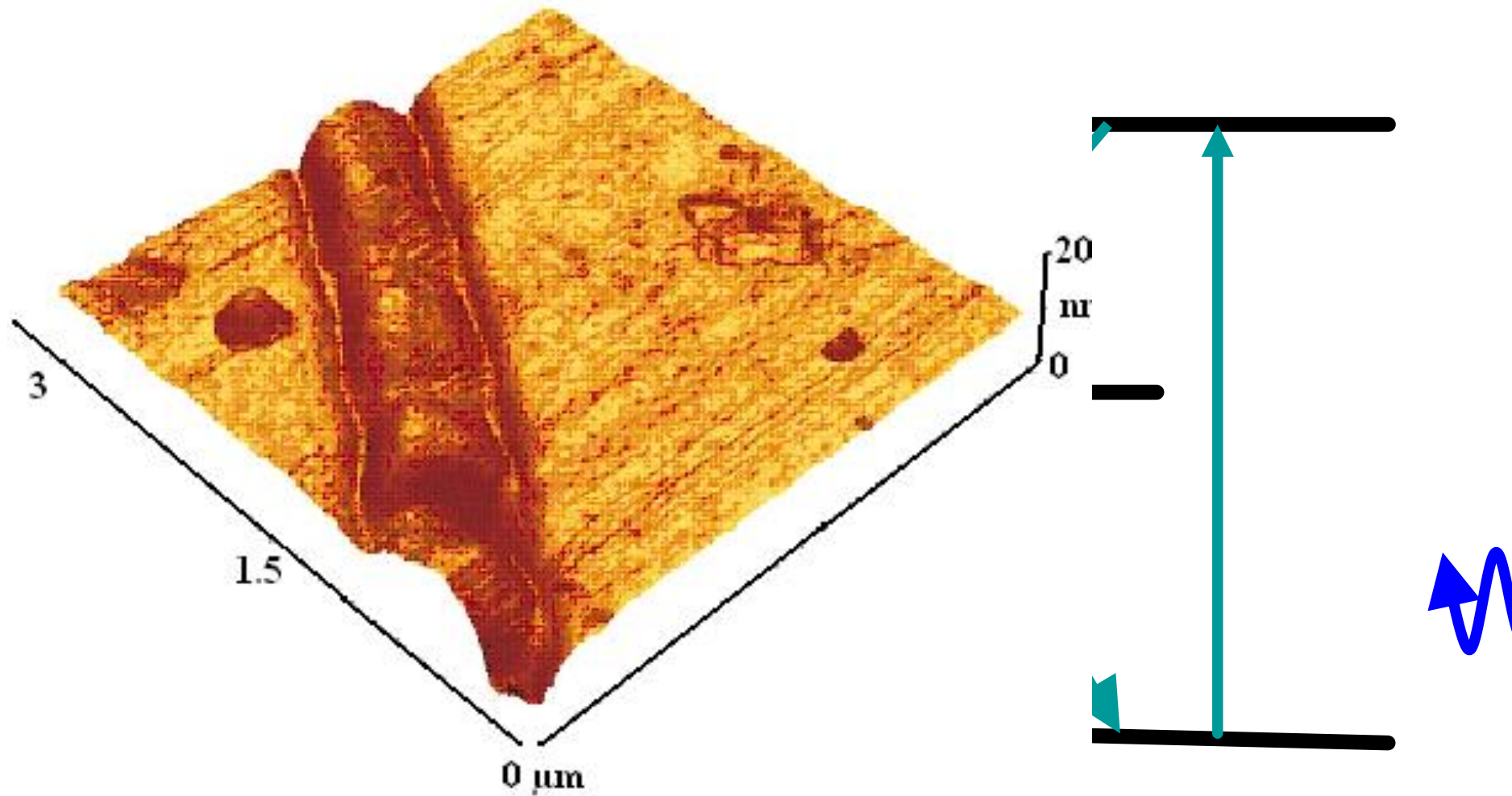




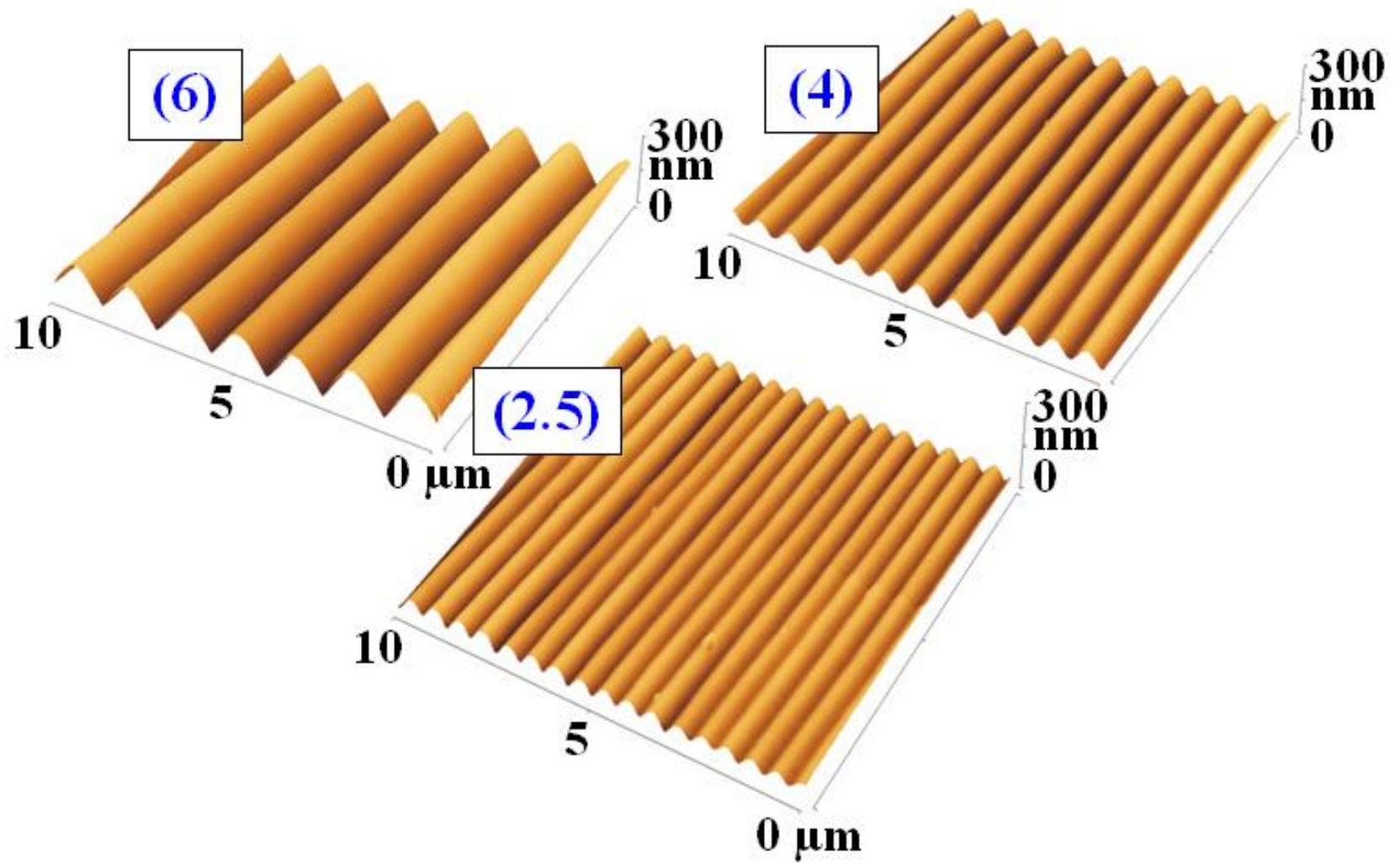
Tvorba nanostruktur na polymeru skenováním laserovým svazkem

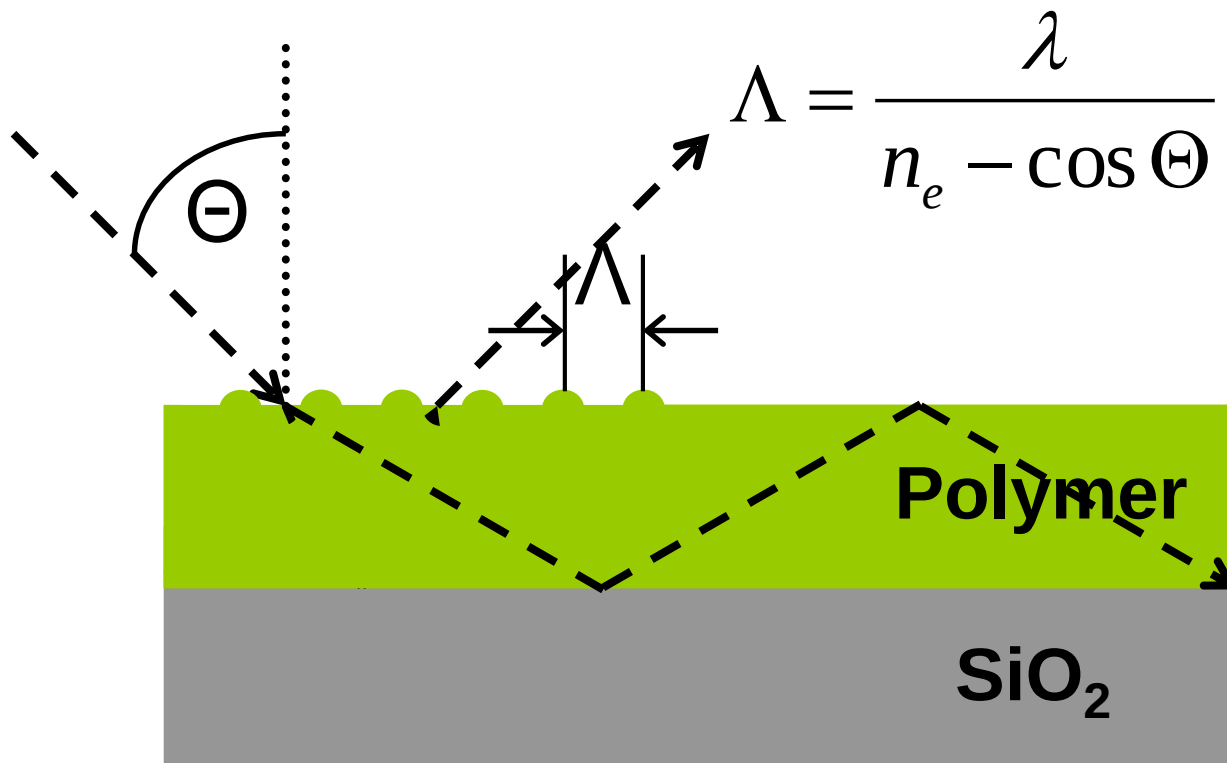
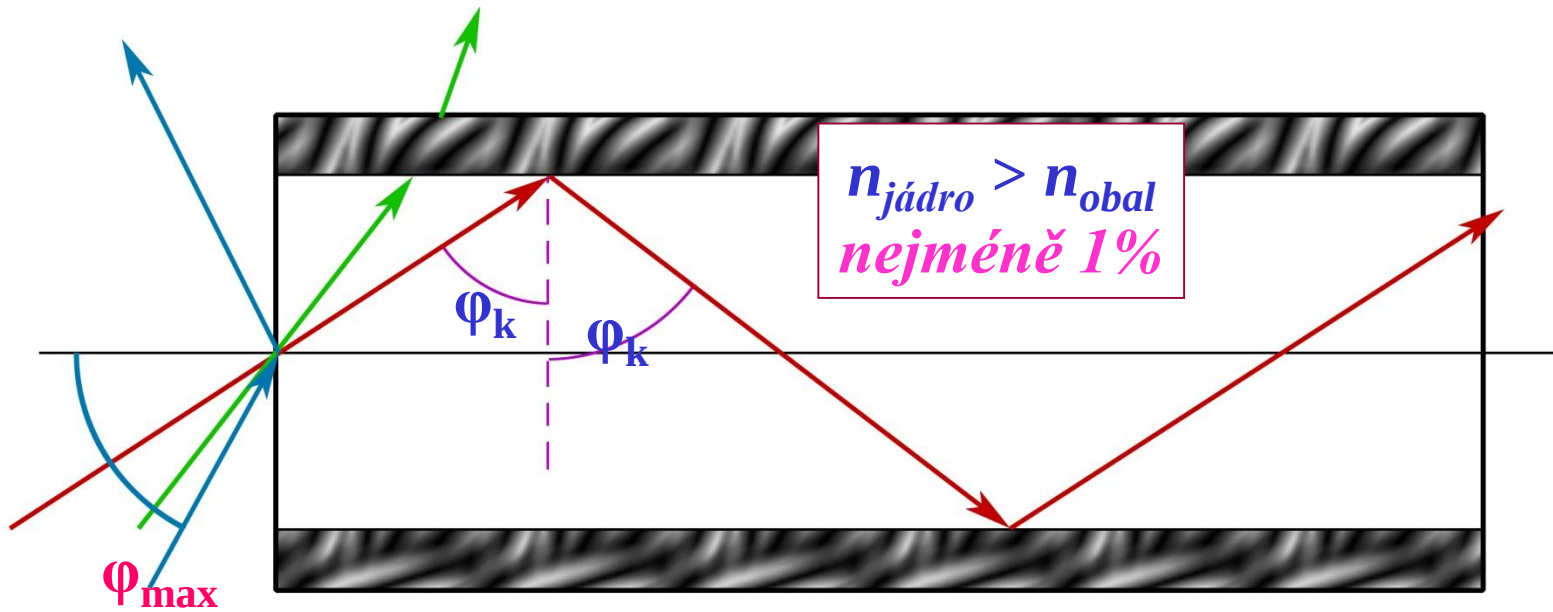
Marangoni jev – redistribuce hmoty
spojena s gradientem povrchového
napětí

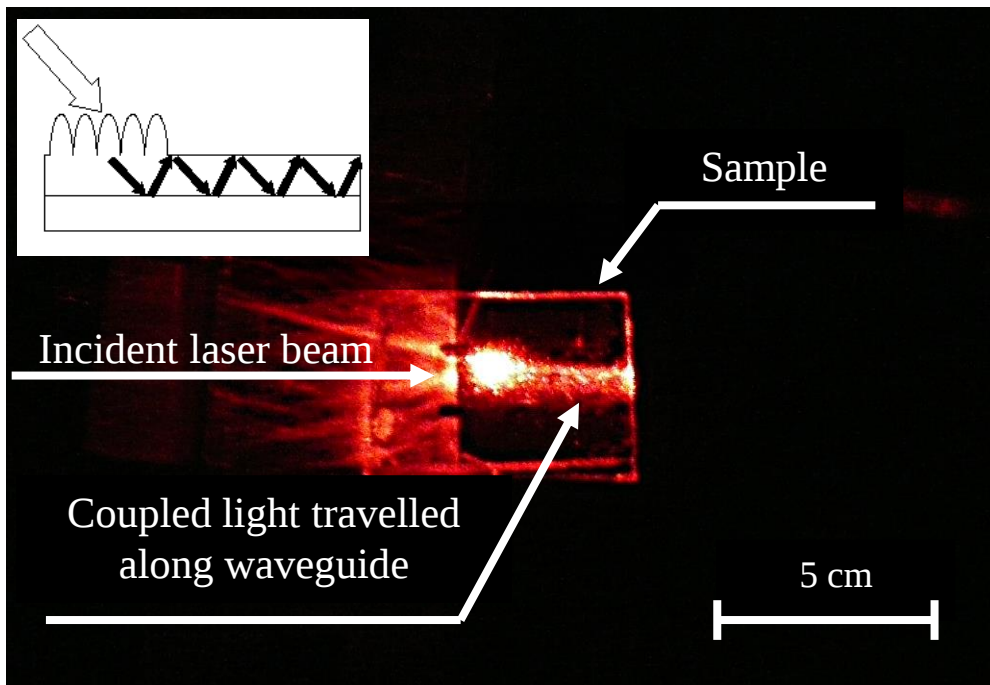




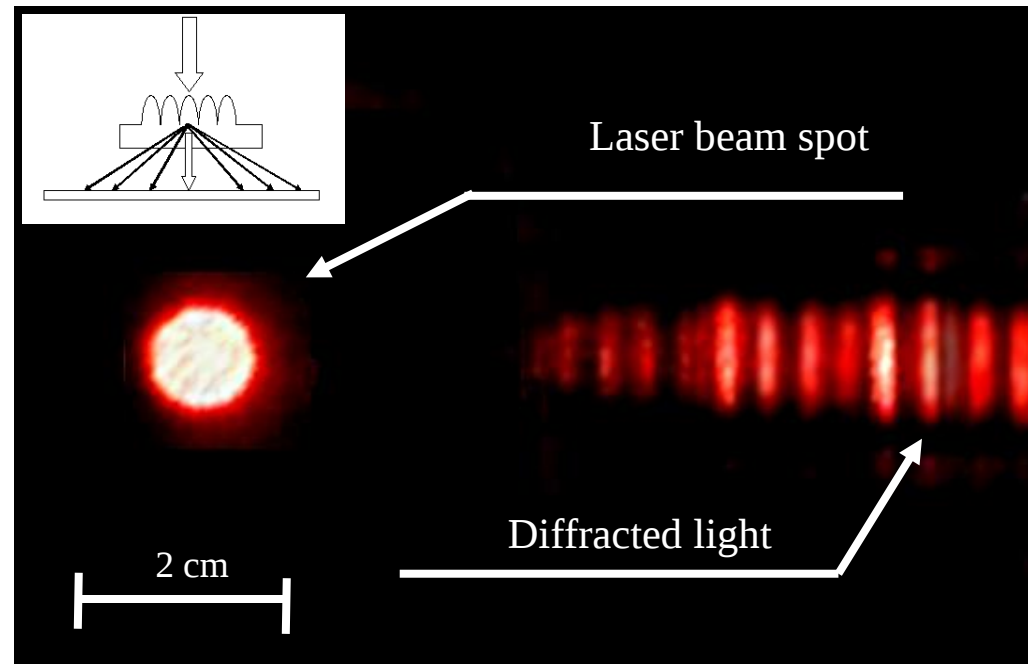
O.Lyutakov, I.Huttel, J.Siegel, V.Švorčík, Appl. Phys. Lett. 95, 173103 (2011).





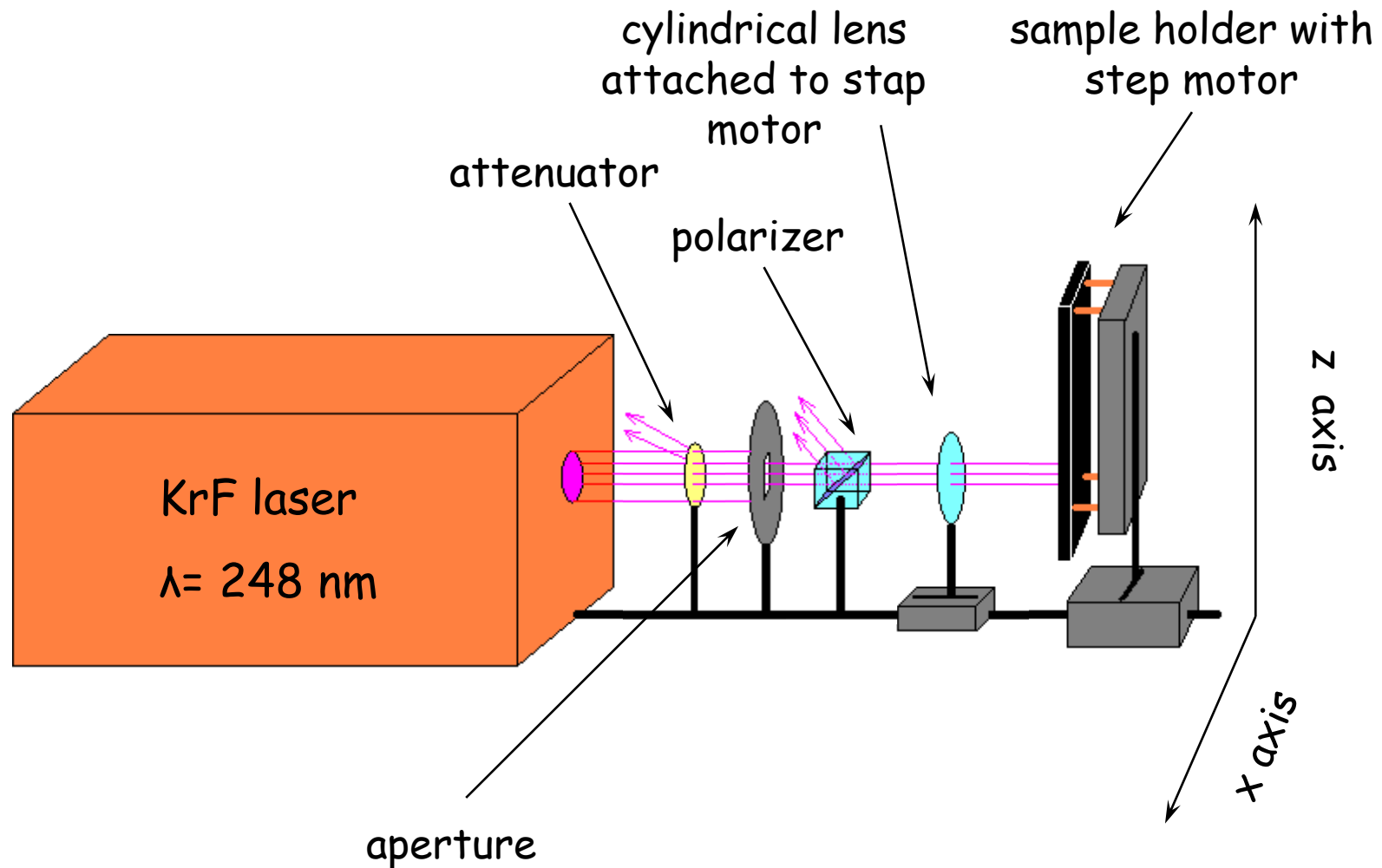


navázání světlovodu

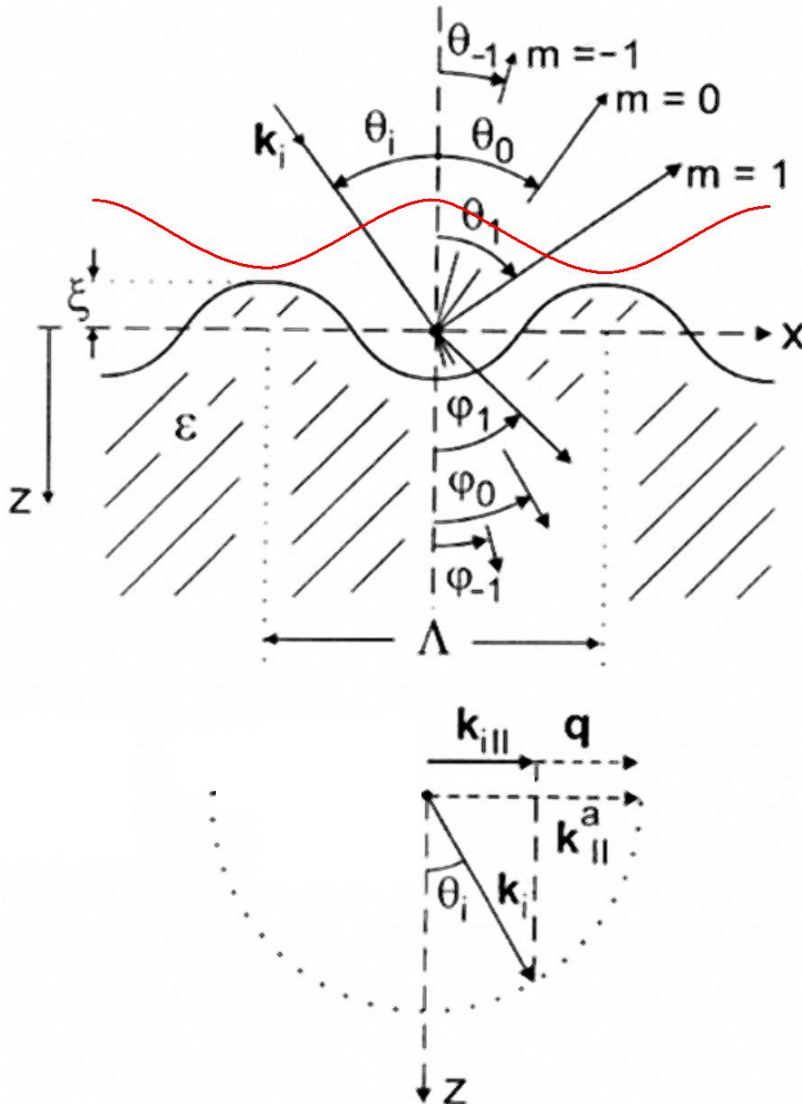


O.Lyutakov, J.Tůma, I.Huttel, V.Prajzler, J.Siegel, V.Švorčík, Appl. Phys. B 110, 539 (2013)

Expozice polarizovaným laserovým světlem



PET s koherentními nanostrukturami po ozáření laserem



Spec.případ: $k_{\parallel}^a \parallel q$

$$\Lambda = \lambda / (n_{\text{eff}} - \sin \theta_i)$$

$$n_{\text{vzduch}} < n_{\text{eff}} < n_{\text{polymer}}$$

Interference rozptýleného a dopadajícího světla

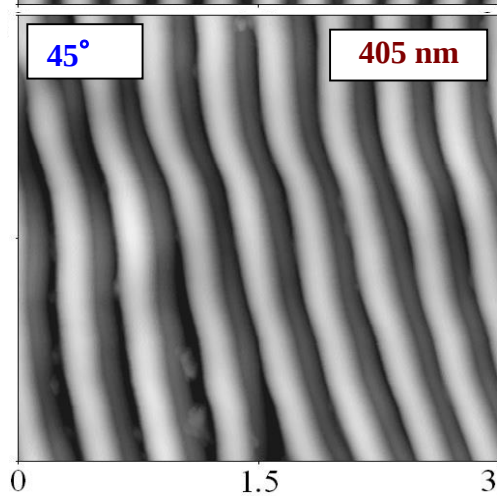
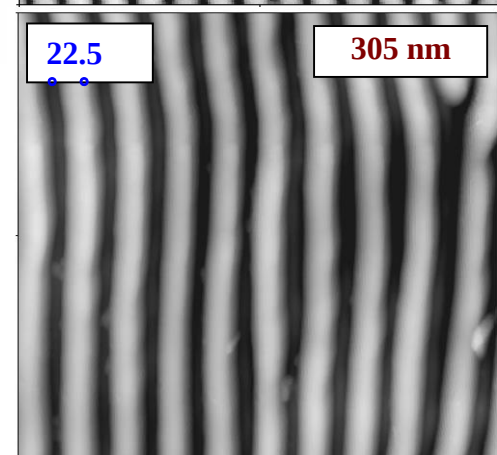
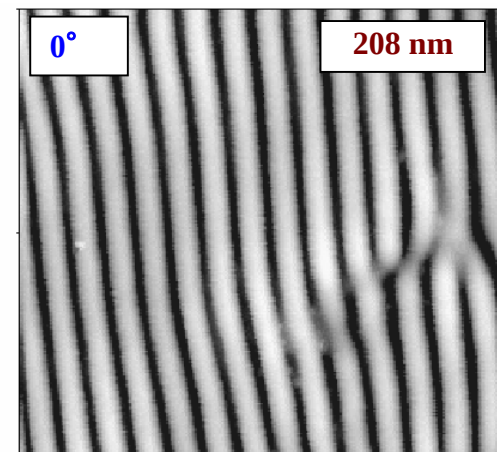
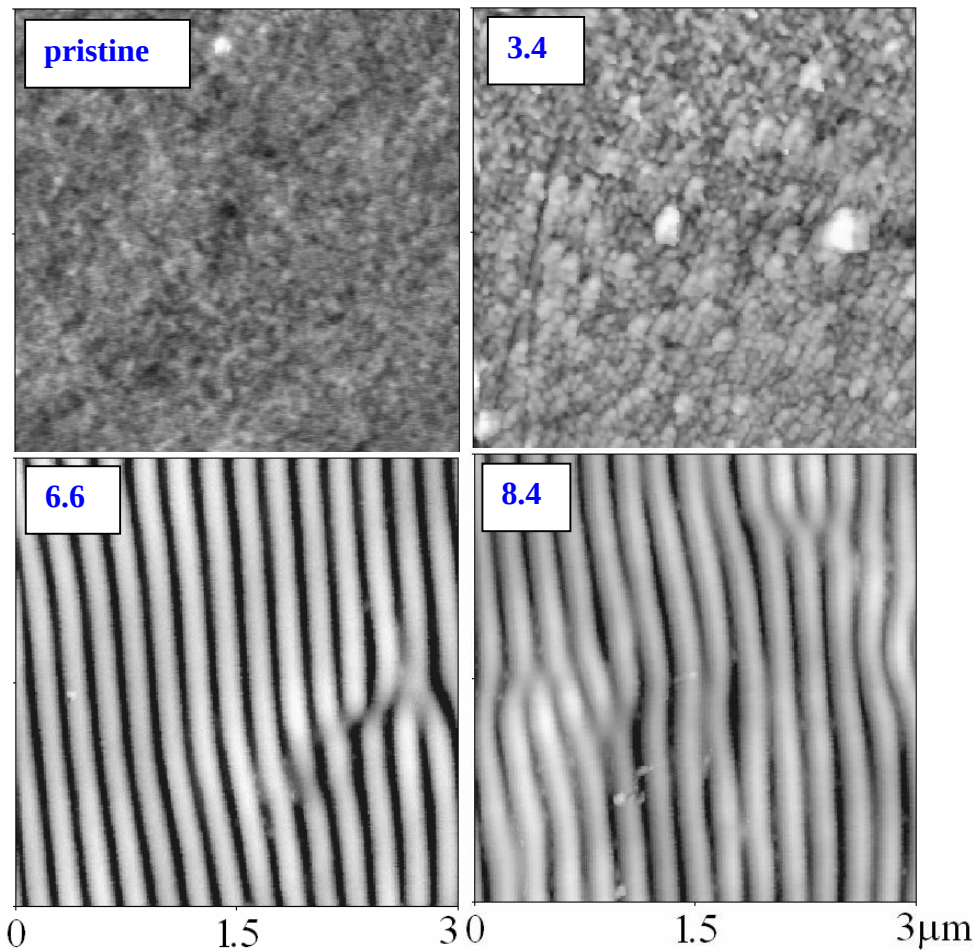
Zpětná vazba $\Rightarrow$ Formování struktury

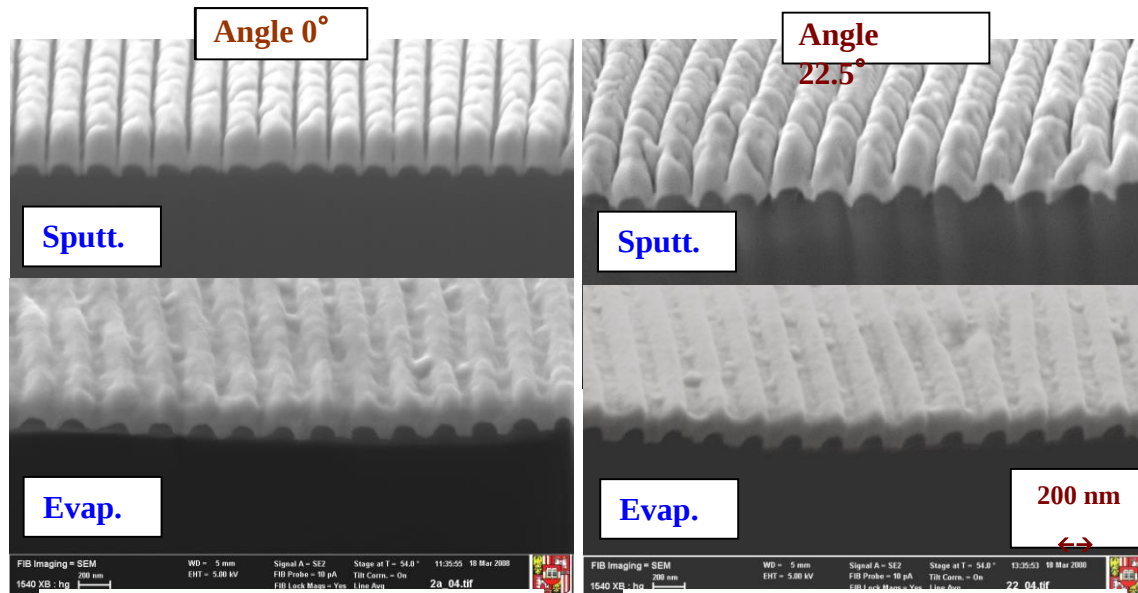
vlnová délka

$$\Lambda^* = \frac{\lambda}{n' - \sin(\theta)} = \frac{248}{1.21 - \sin(0)} \approx 205 \text{ nm}$$

index lomu

úhel dopadu

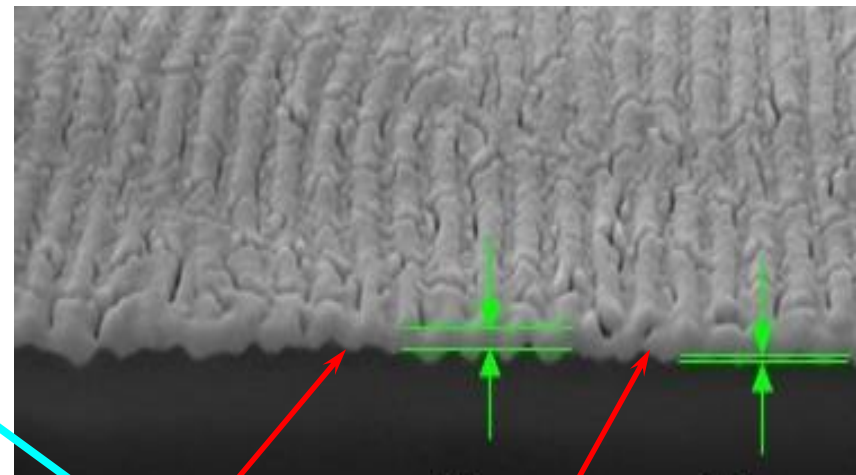
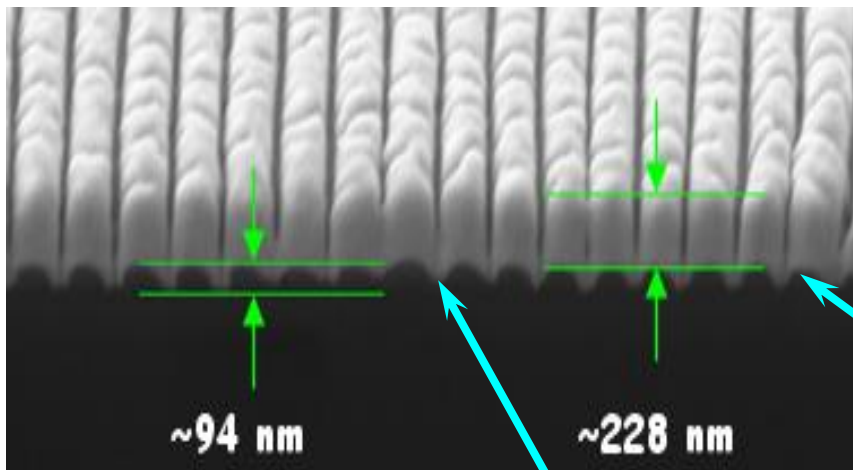




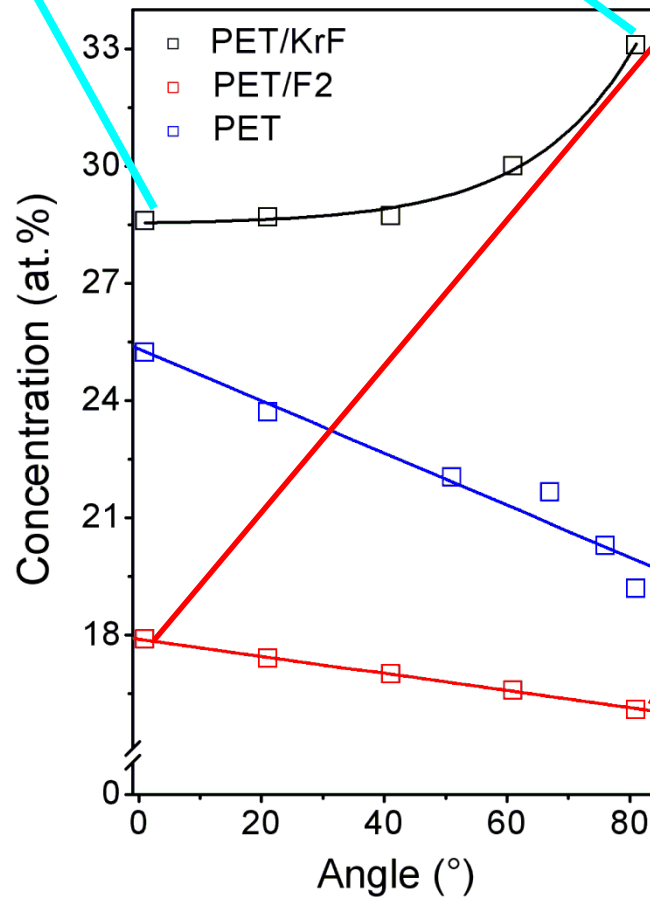
Sputtering

Evaporation

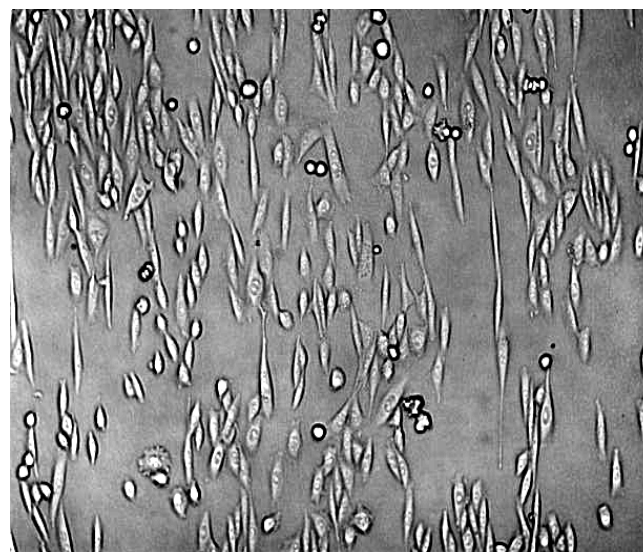
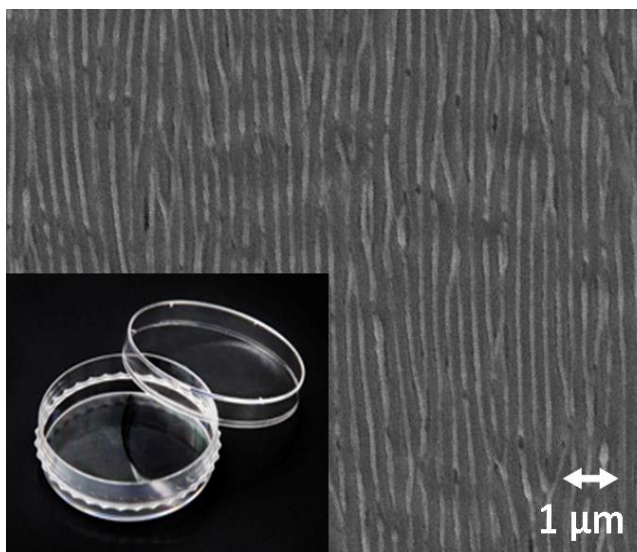
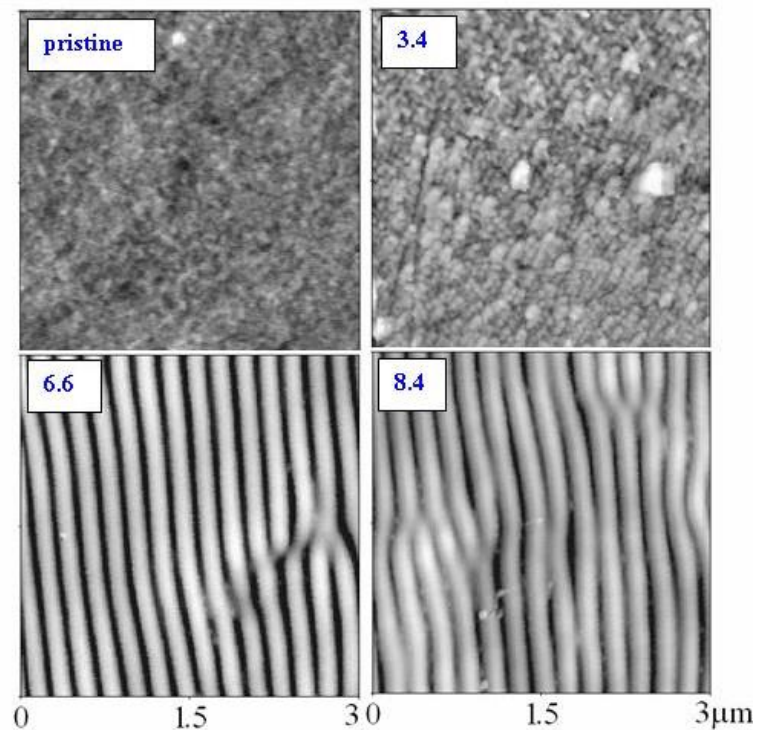
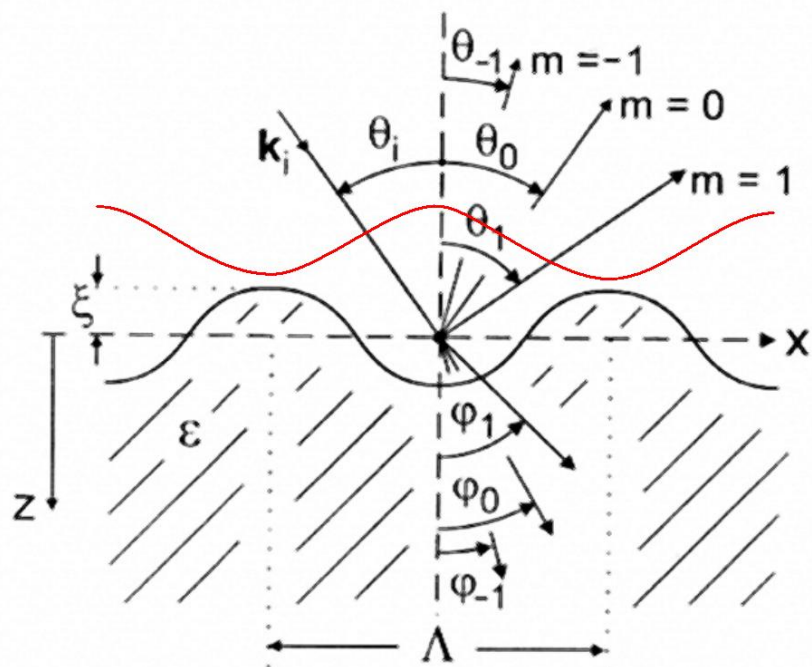




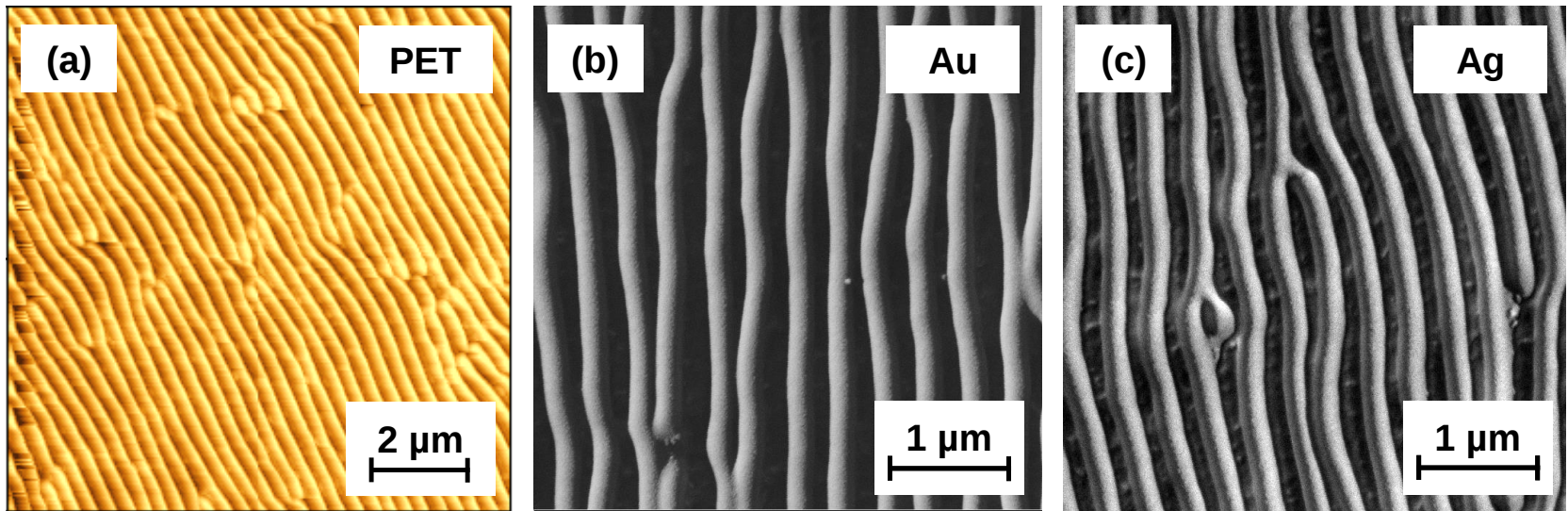
KrF



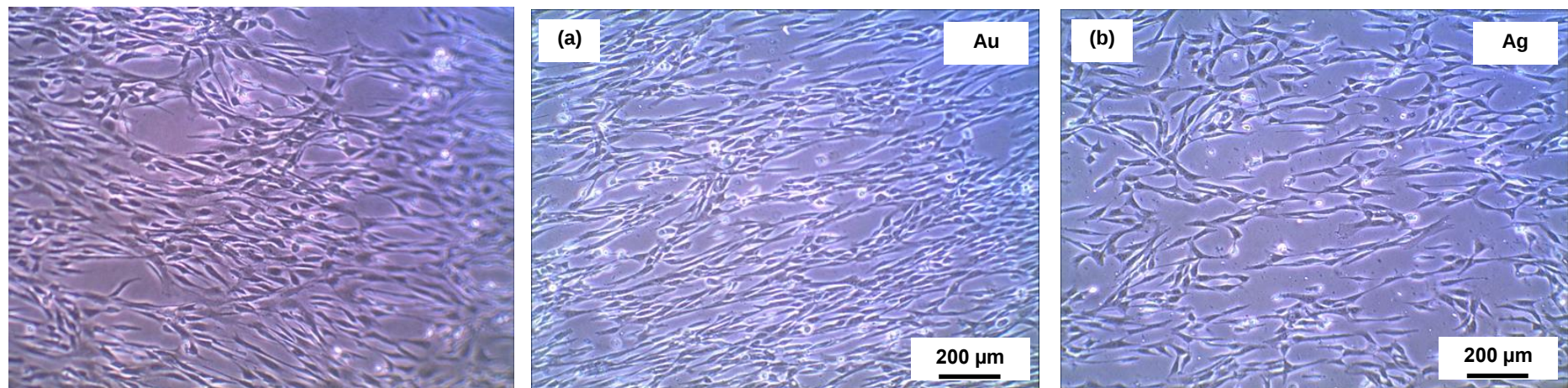
J. Siegel, P. Slepíčka, J. Heitz, Z. Kolská, P. Sajdl, V. Švorčík, Appl. Surf. Sci. 256, 2205 (2010).



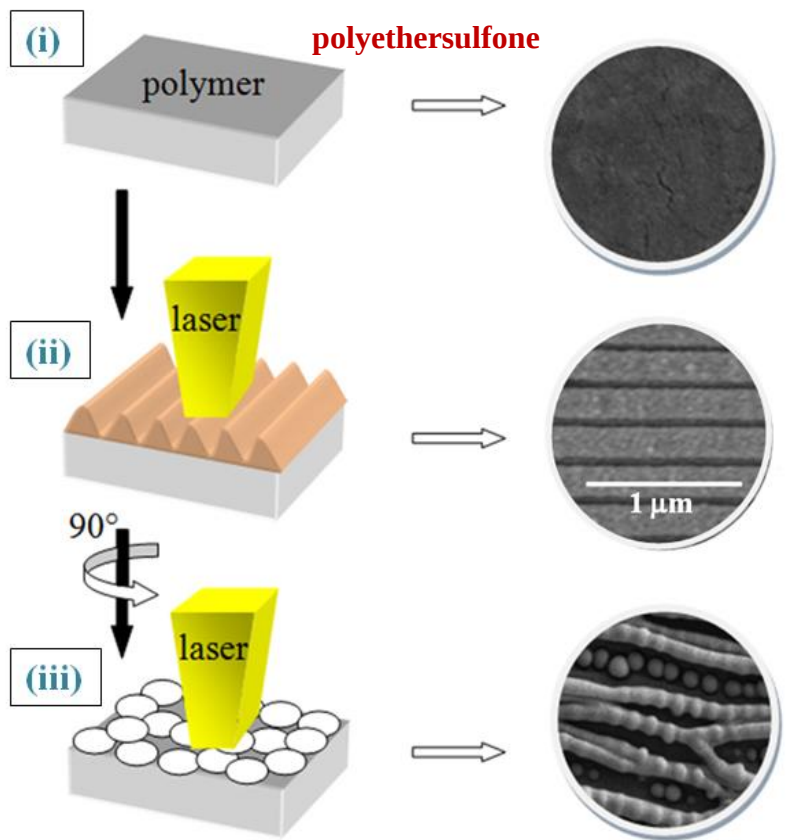
J. Siegel, J. Heitz, V. Švorčík, *Surf. Coat. Technol.* 206, 517 (2011).



AFM image of LIPSS structures on PET irradiated under $q=30^\circ$ by a KrF laser. (b,c) SEM images of Au and Ag nanowires, respectively, on these LIPSS structures produced by evaporation under an inclined angle (nominal film thickness 15 nm)



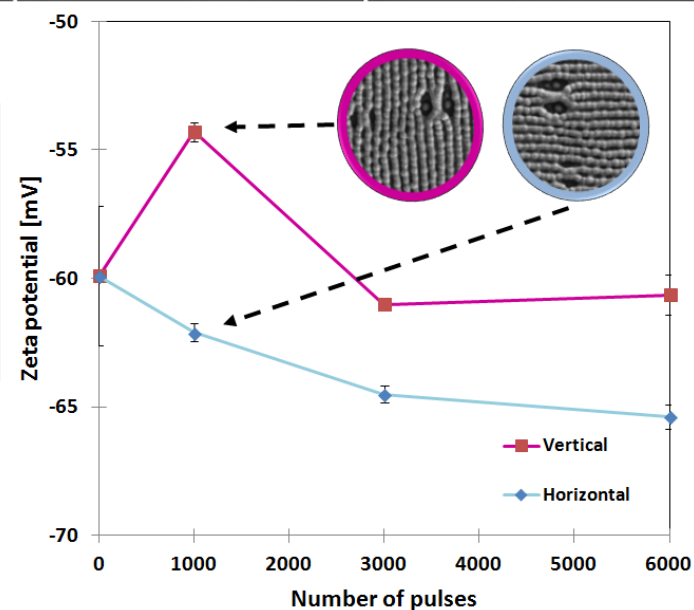
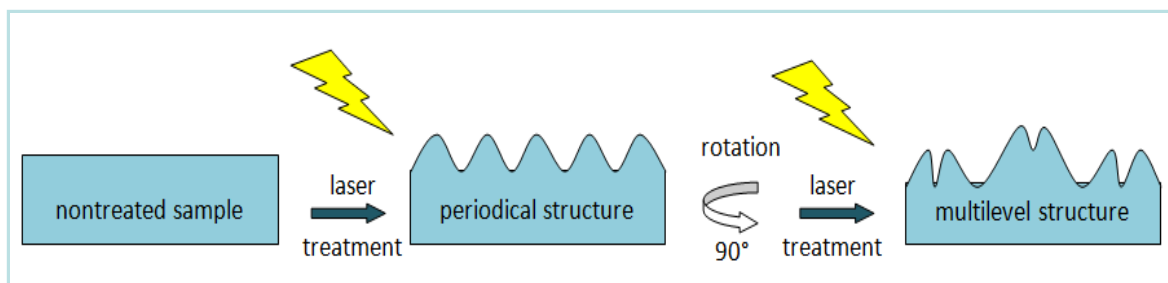
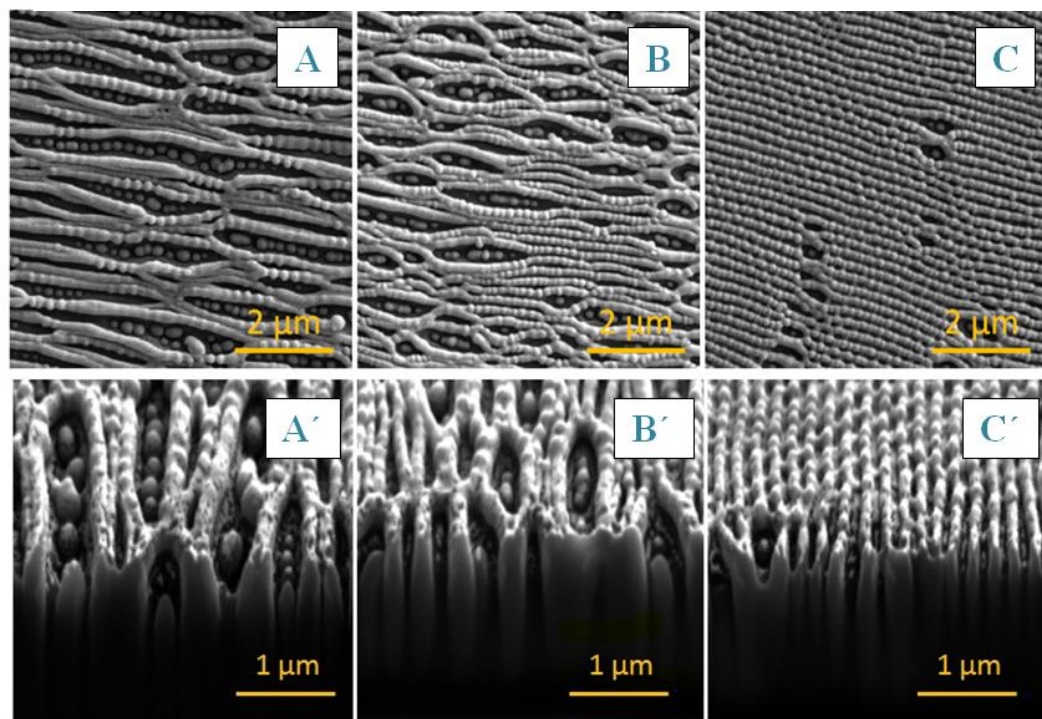
Phase contrast microscope images (100x magnification) of primary human myoblasts 48 hours after seeding on PET foils with LIPSS and (a) Au and (b) Ag nanowires, respectively



**SEM - 6000 (A),
FIB-SEM -**

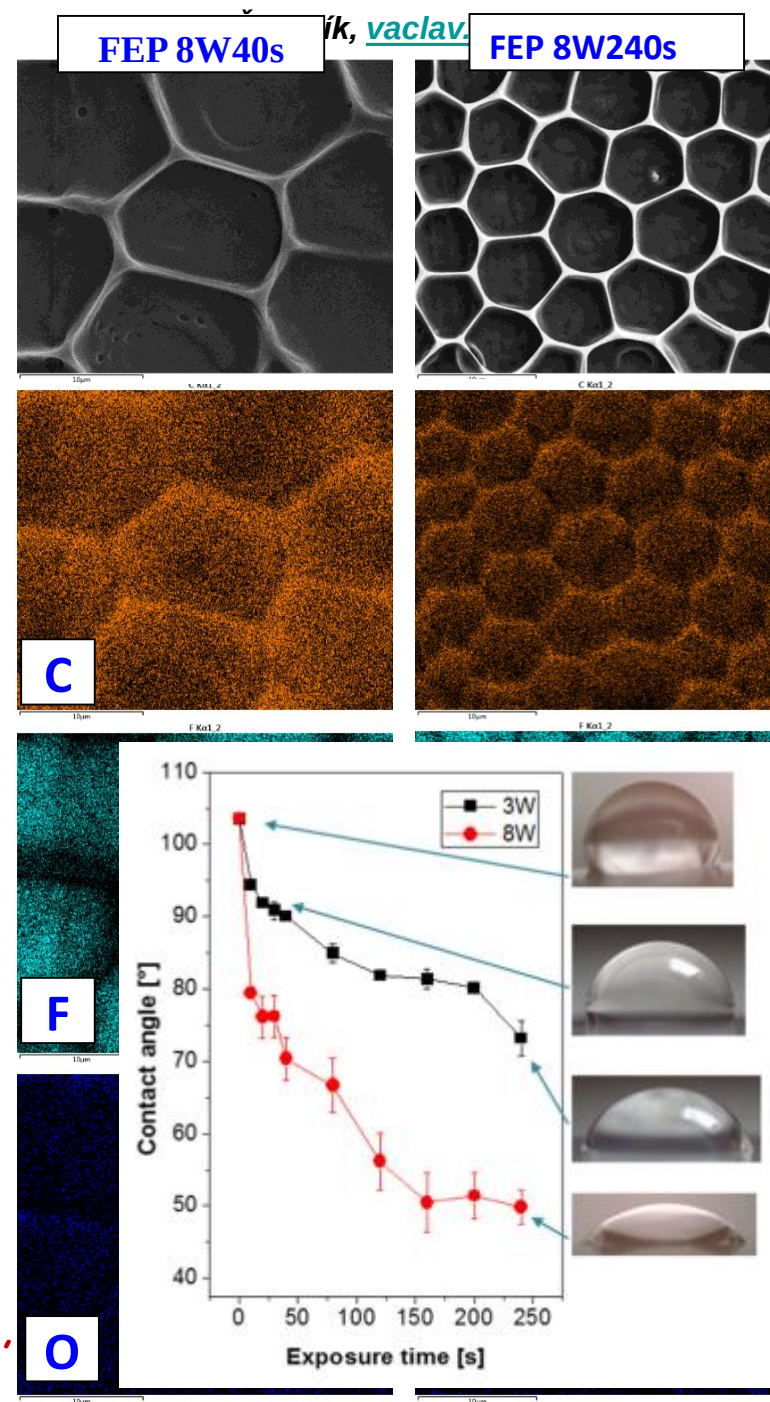
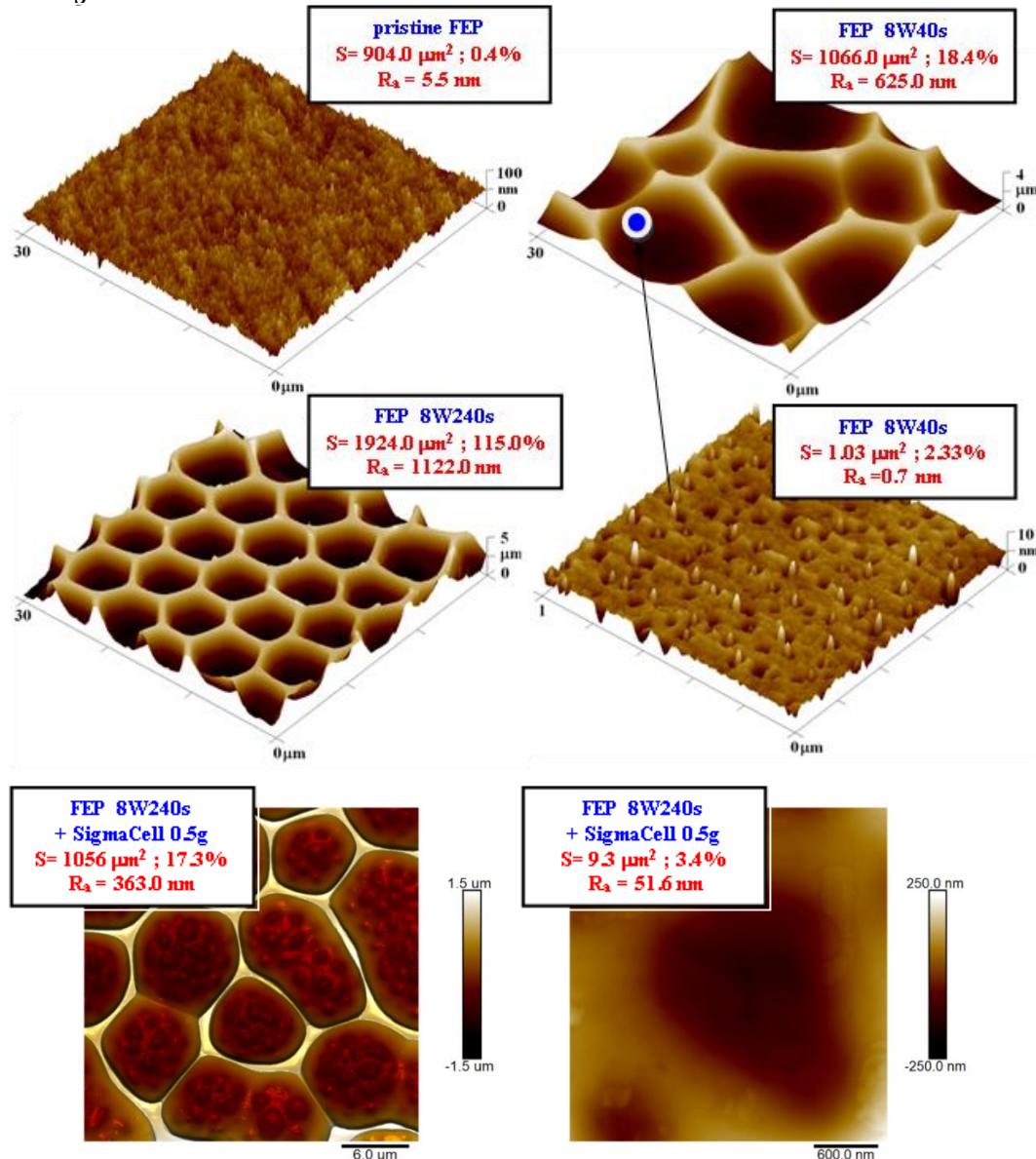
3000 (B),

1000 pulses (C)



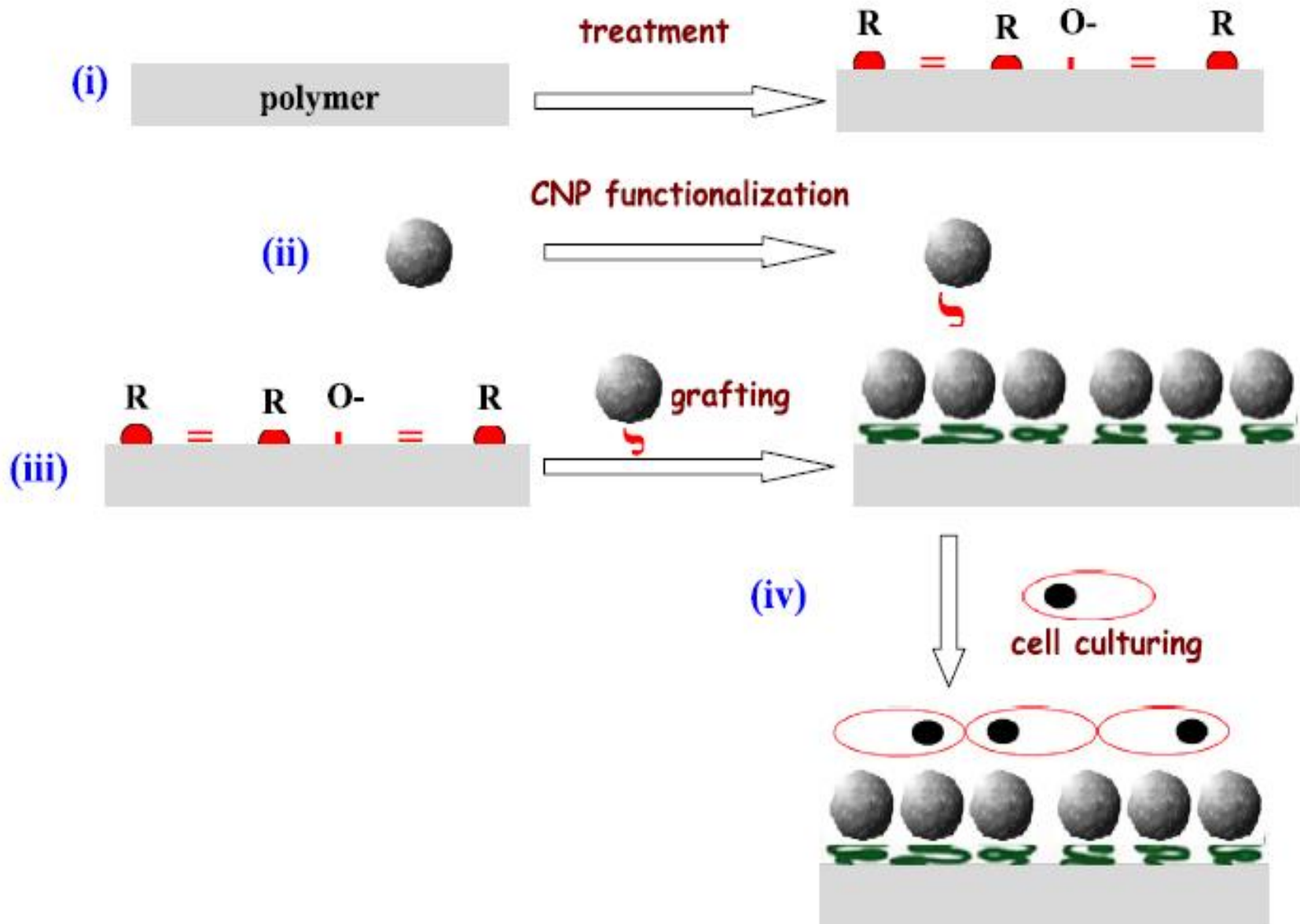
**D.Fajstavr, I.Michaljaničová, P.Slepička, O.Neděla, P.Sajdl,
Z.Kolská, V.Švorčík, React. Funct. Polym. 125, 20-28 (2018).**

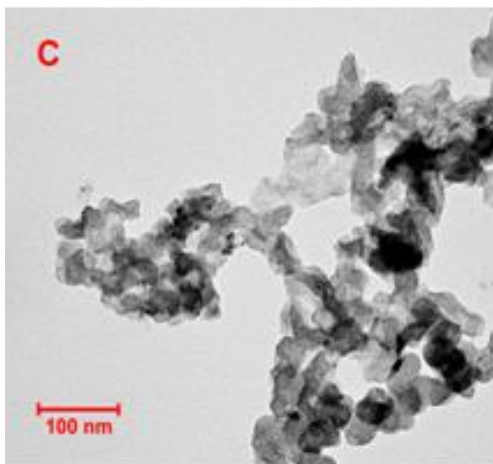
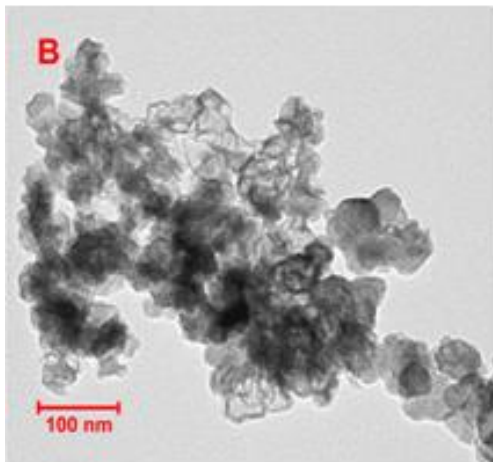
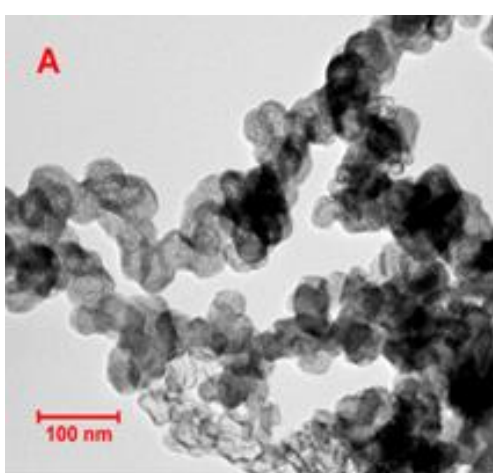
perfluoroethylene propylene (FEP) + Poly-L-lactic honey-comb like structures



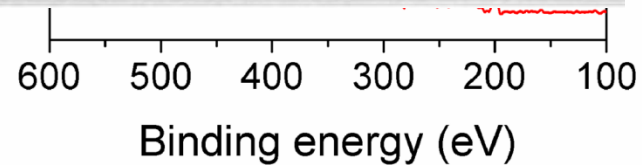
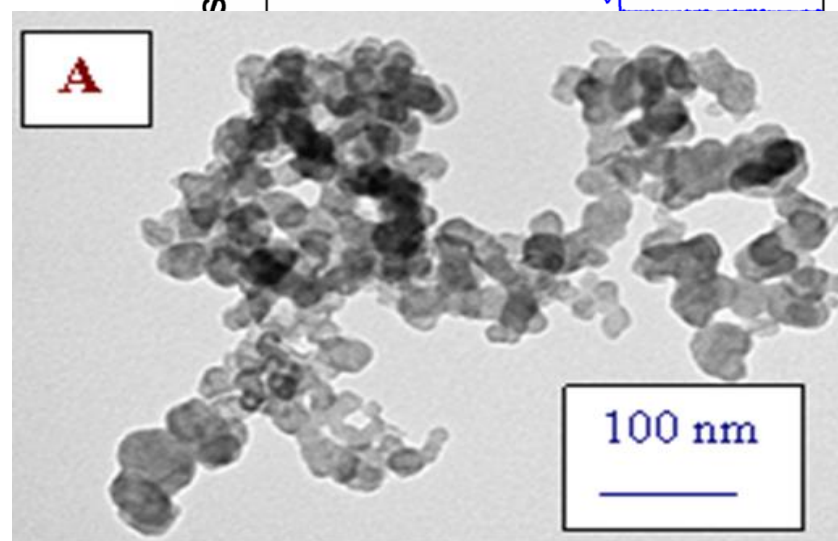
P. Slepíčka, K. Neznalová, D. Fajstavr, N. Slepíčková Kasálková, V. Švorčík, Plasma Proc. Polym. 16, 1-6, 1900063 (2019).

(iii) roubování funkcionalizovaných uhlíkových nanočástic

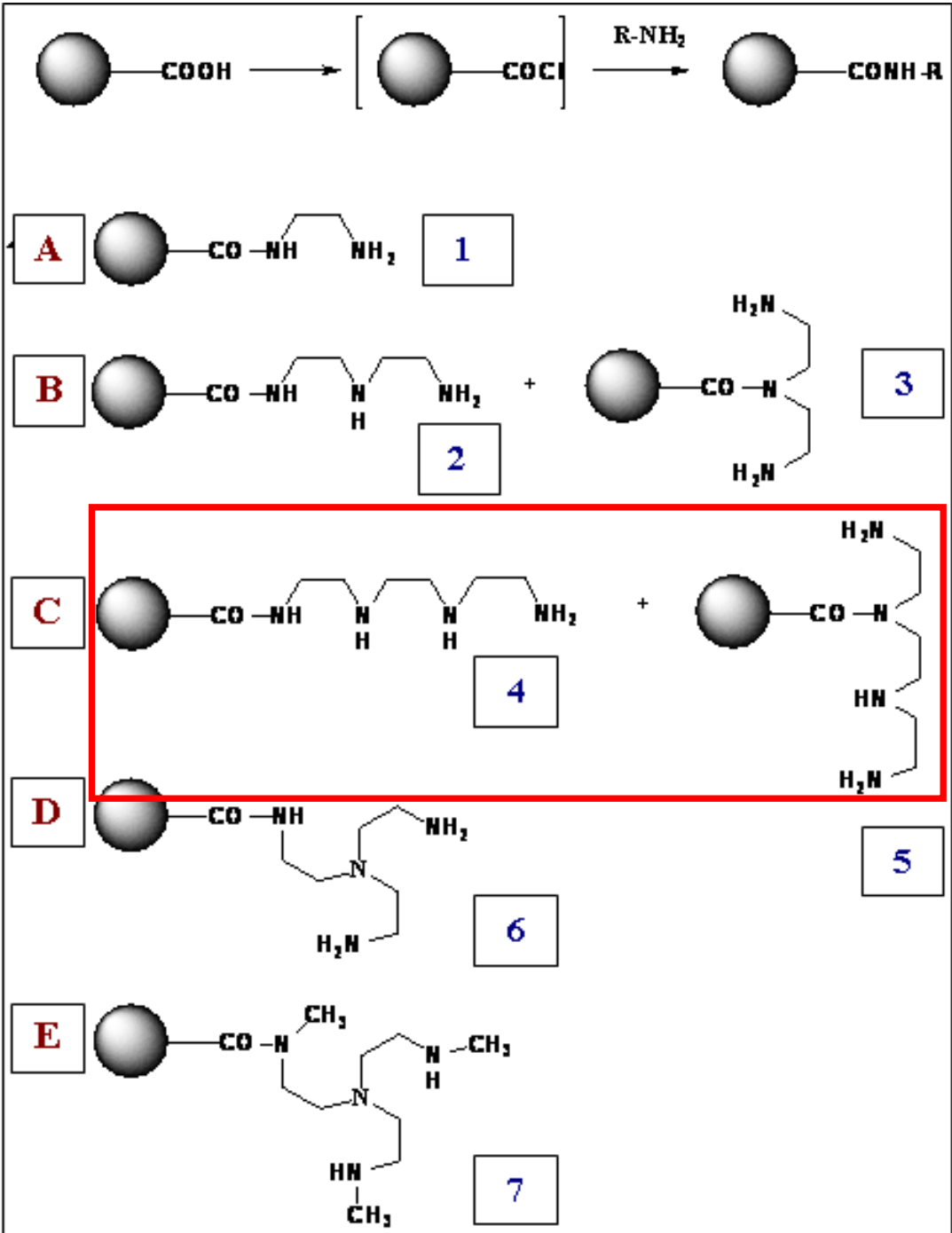




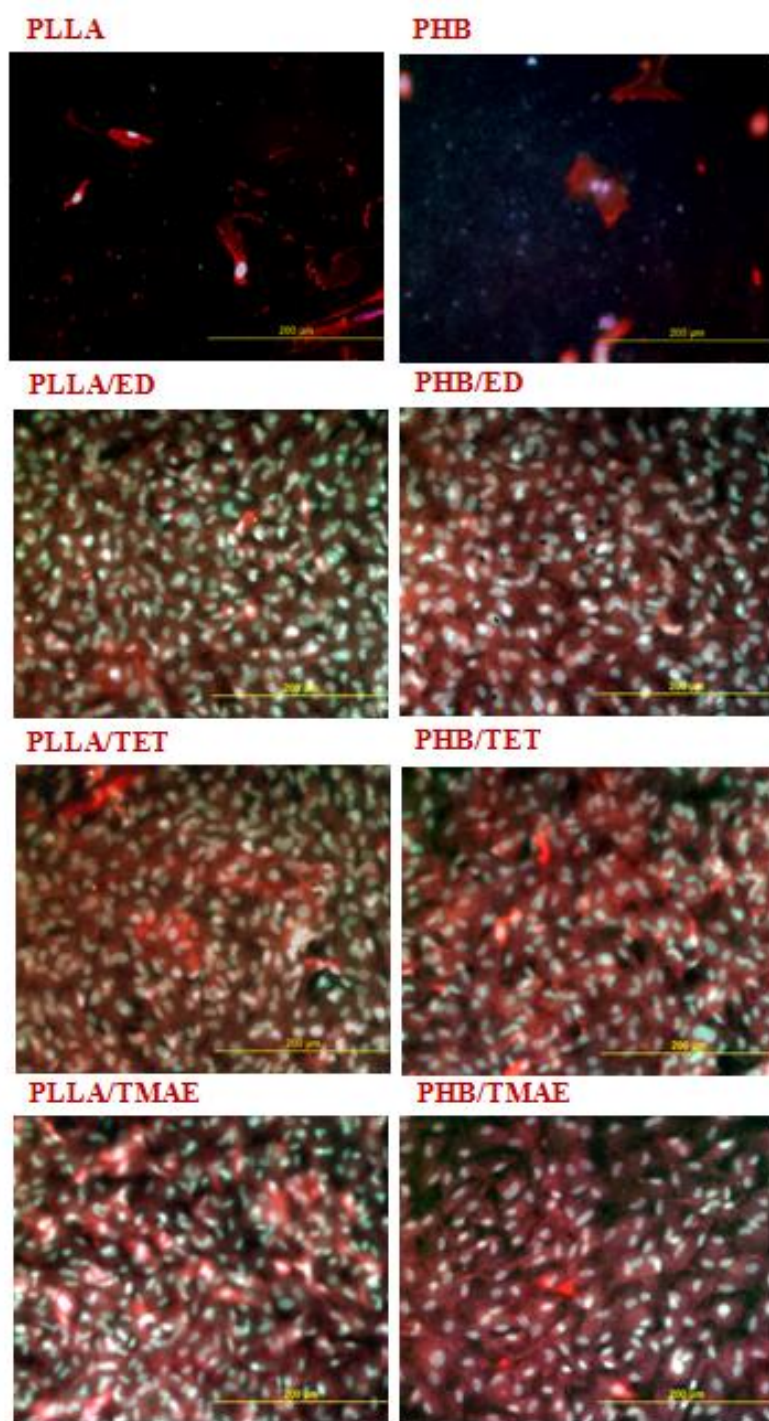
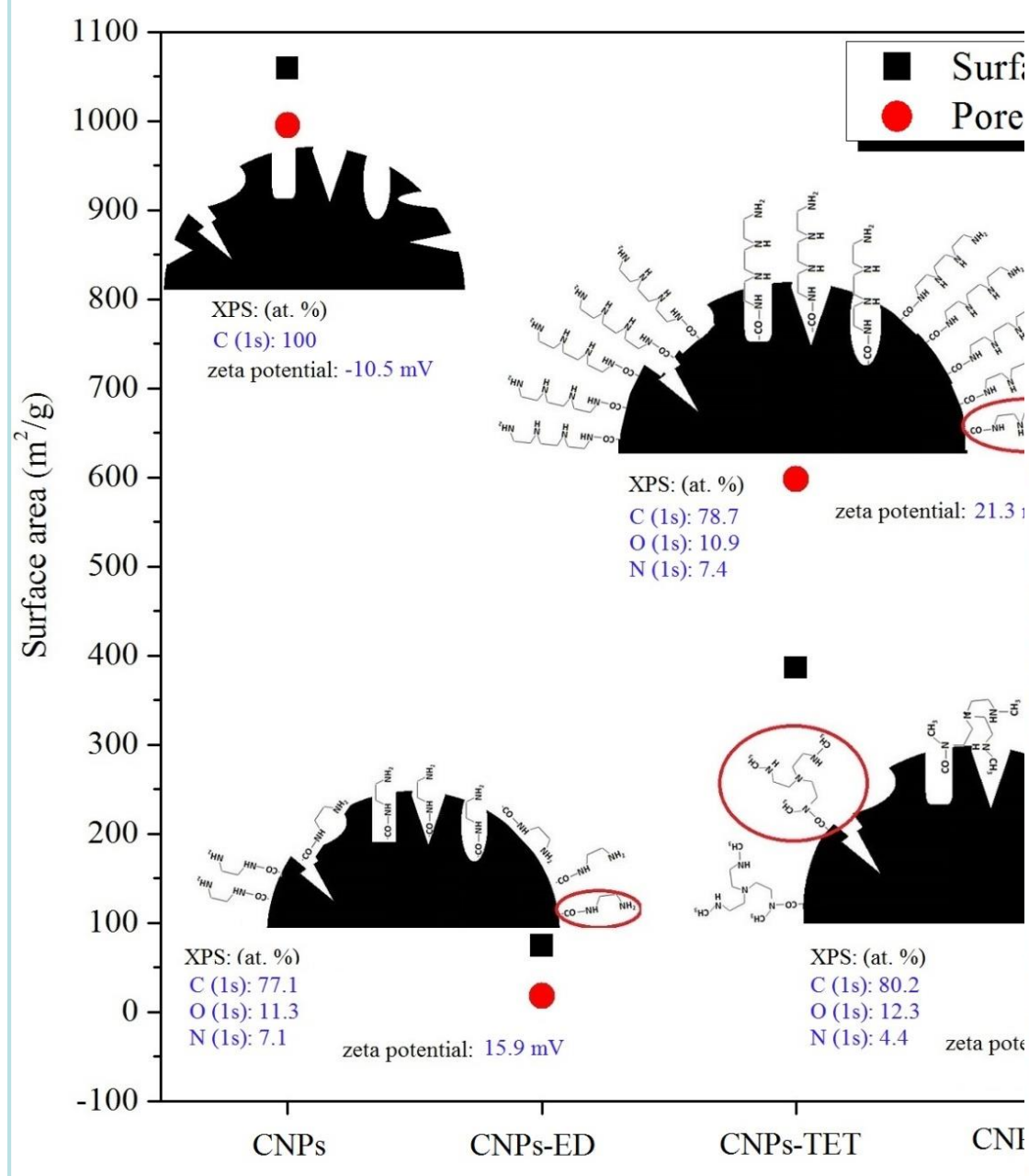
	C-pristine	C-NH ₂	C-CONH(CH ₂) ₆ NH ₂
Surface area (m ² g ⁻¹)	105		
Pore volume (ml g ⁻¹)	2.3		



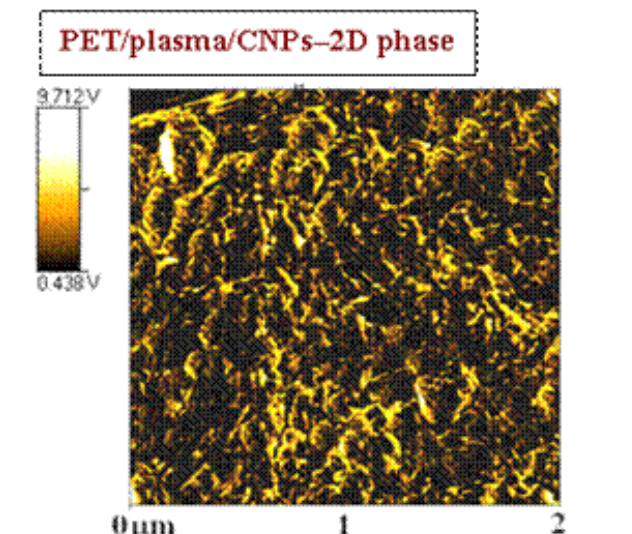
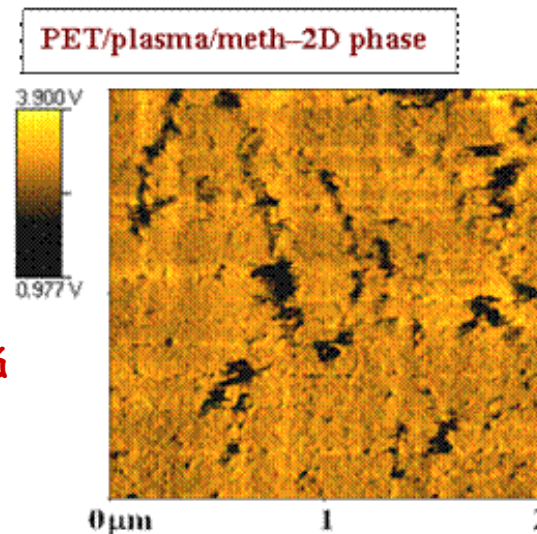
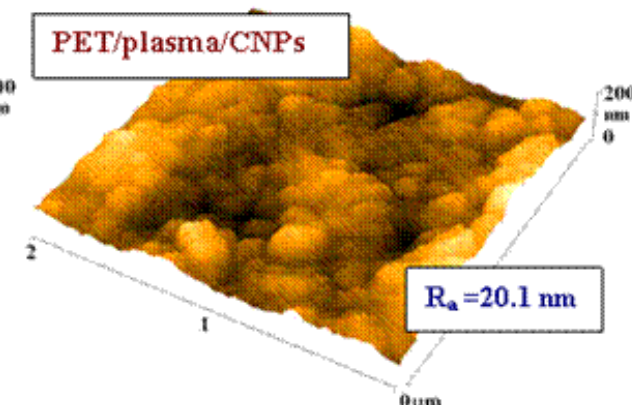
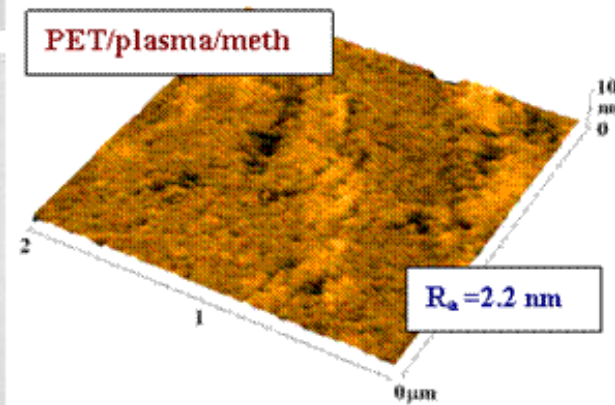
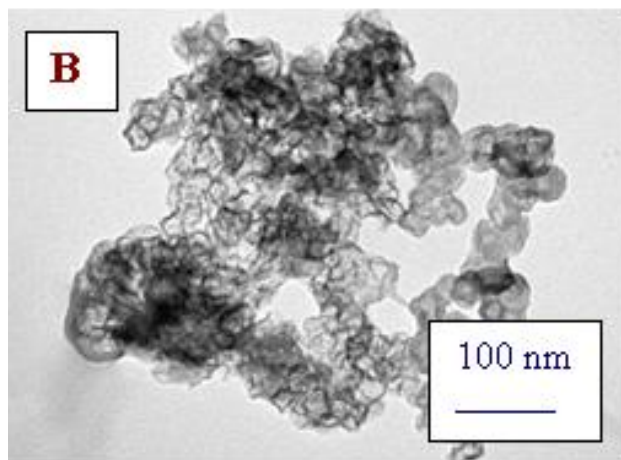
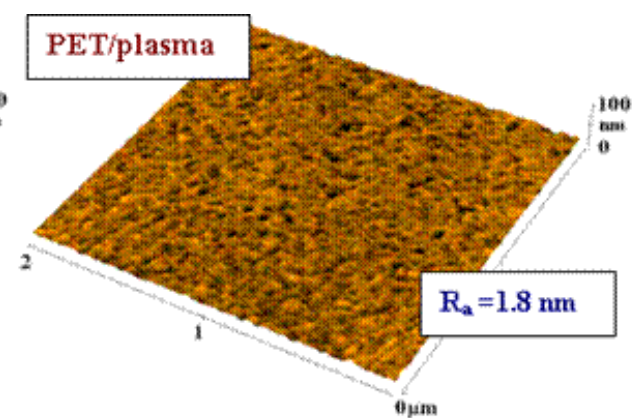
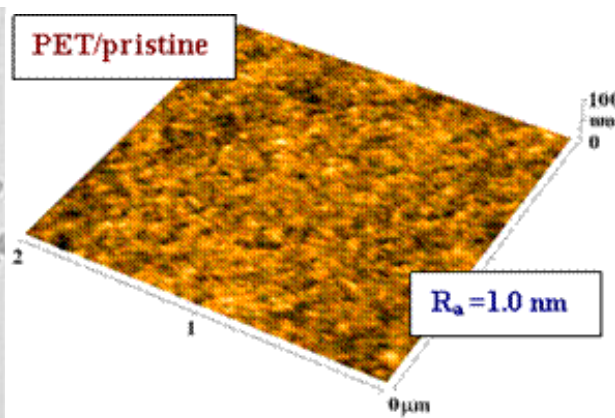
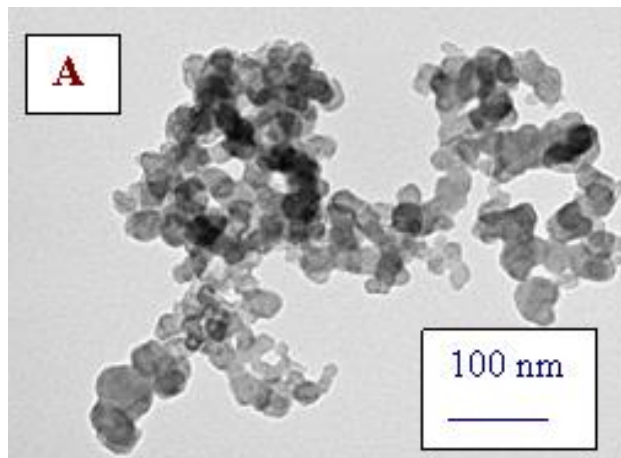
**S.Trostová, I.Stibor, J.Karpíšková,
Z.Kolská, V.Švorčík, Mater. Lett.
102-103, 83-86 (2013).**



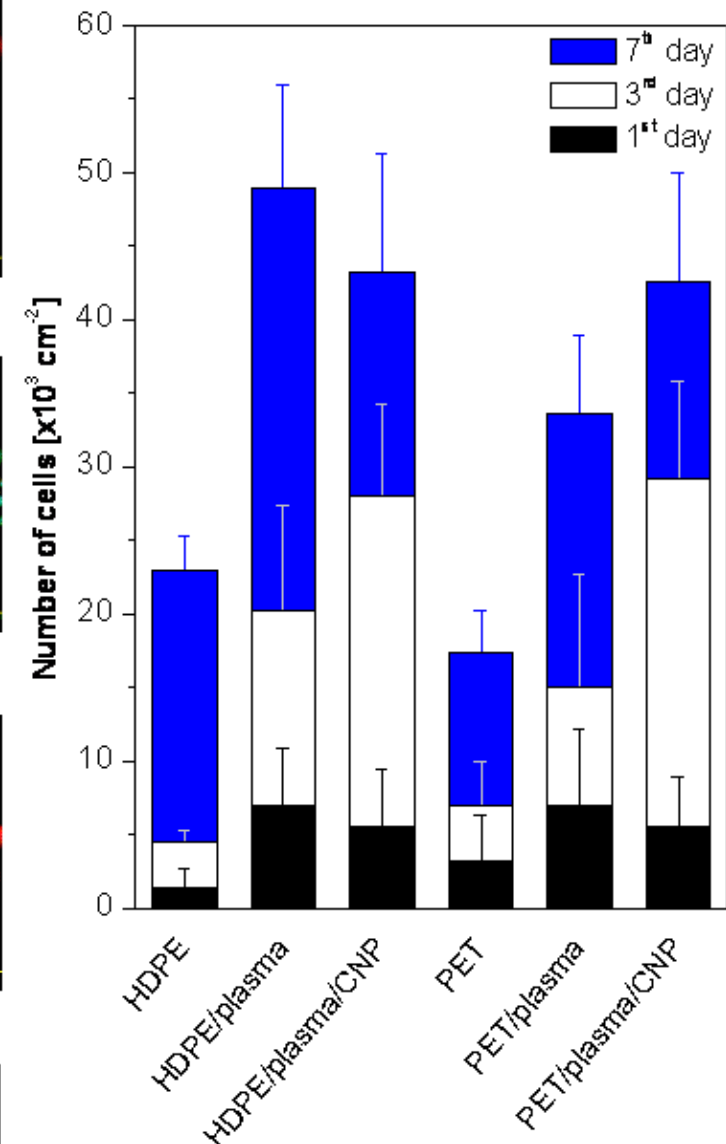
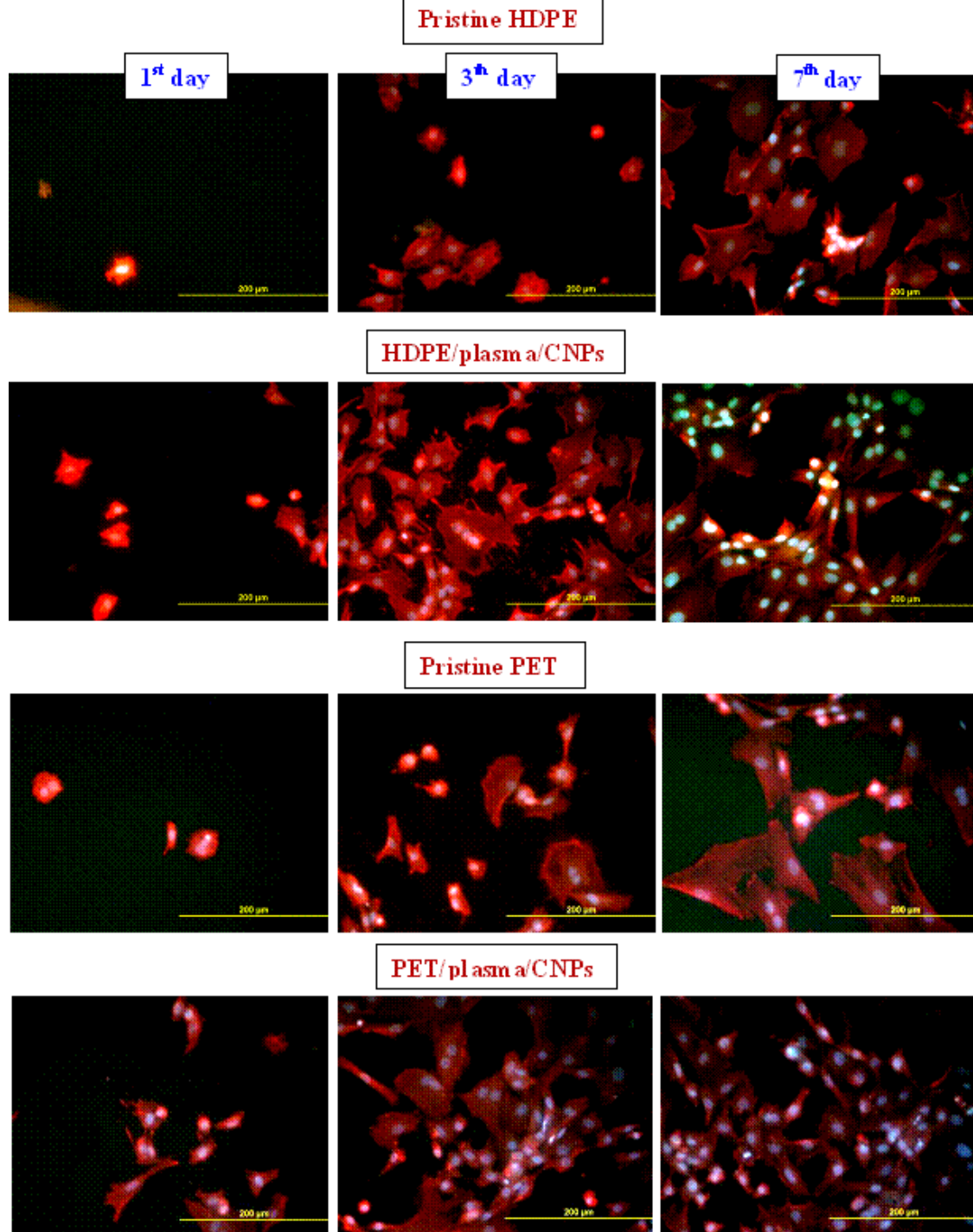
V.Švorčík, Z.Makajova, N.Slepičková
Kasálková, Z.Kolská, I.Stibor,
J.Karpíšková, P.Žáková, P.Slepička,
Carbon, 69, 361-371 (2014).



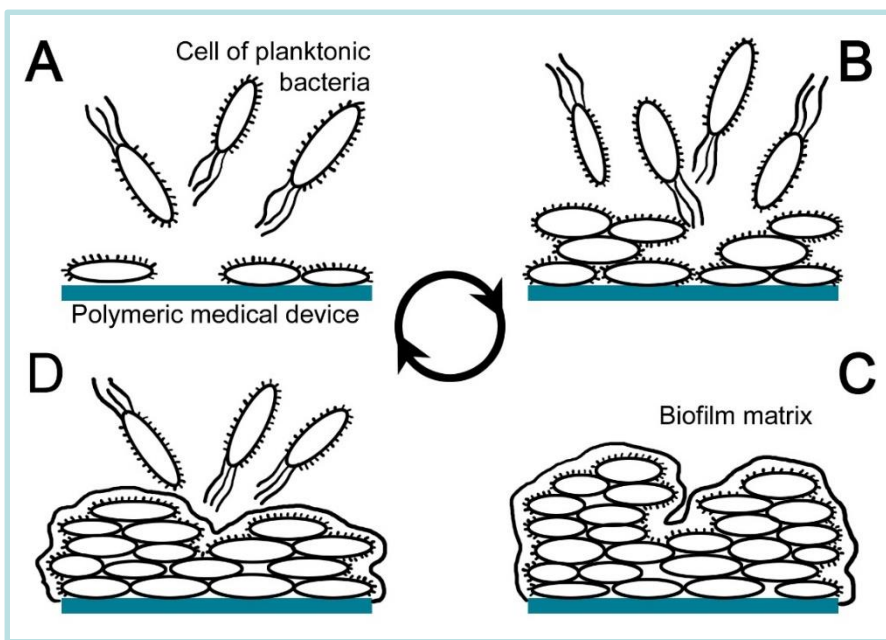
N. Slepíčková Kasálková, P. Žáková, I. Stibor, P. Slepíčka, Z. Kolská, J. Karpíšková, V. Švorčík, *Mater. Technol.* 34, 376–385 (2019).



V. Švorčík, Z. Makajova, N. Slepíková, Kasálková, Z. Kolská, I. Stibor, J. Karpíšková, P. Žáková, P. Slepíčka, Carbon, 69, 361-371 (2014).



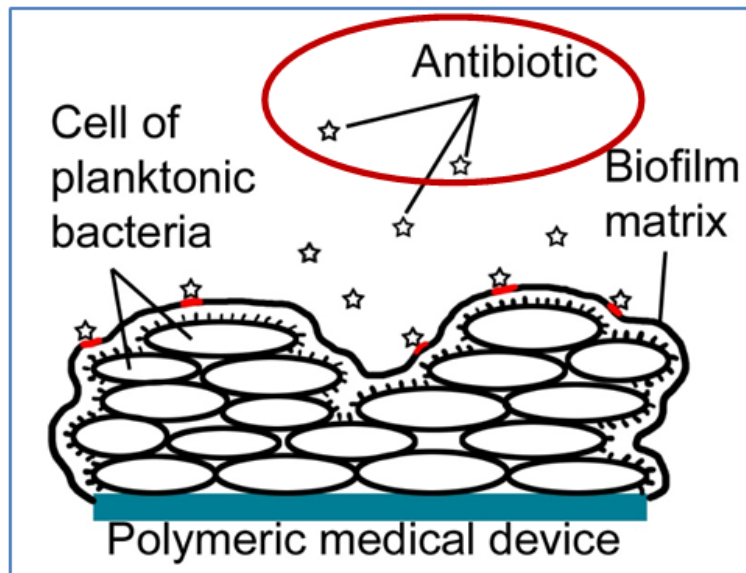
V.Švorčík, Z.Makajova, N.Slepičková
Kasálková, Z.Kolská, I.Stibor,
J.Karpíšková, P.Žáková, P.Slepička,
Carbon, 69, 361-371 (2014).



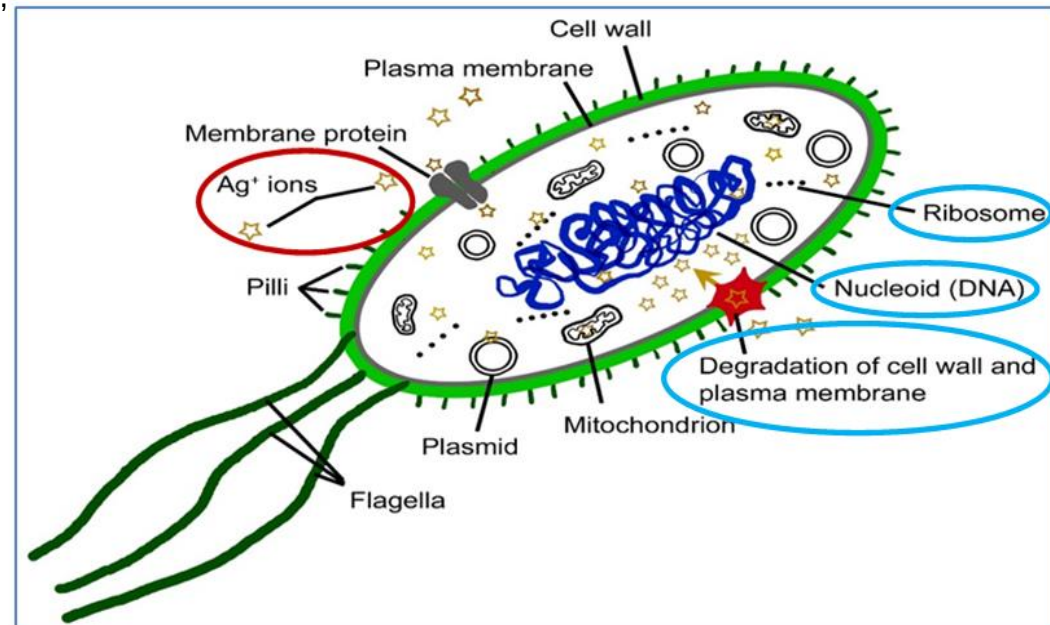
 Bakterie množení.mp4

 Bunka mezi bakteriemi.mp4

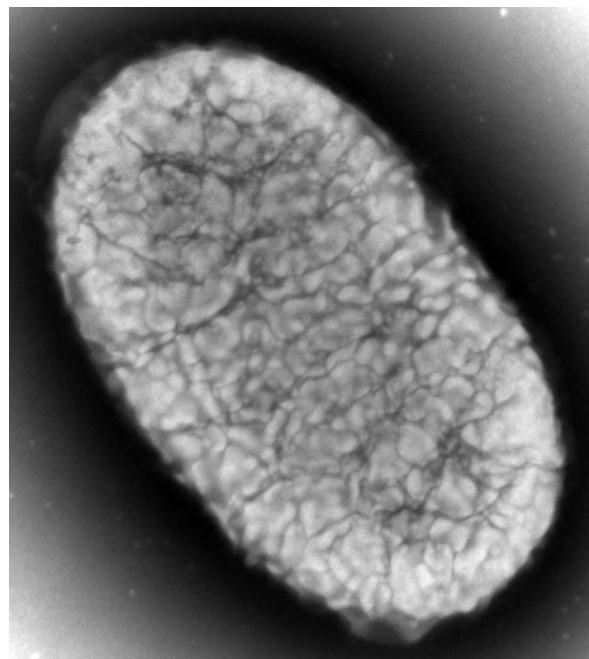
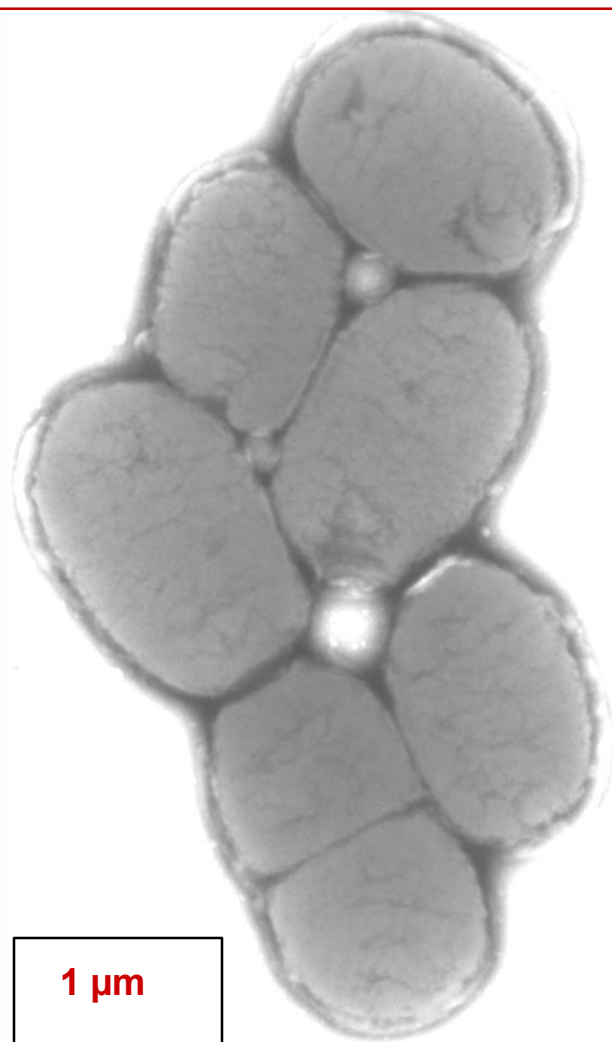
Phases of biofilm formation: A) attachment, B) expansion, C) maturation and D) dispersion

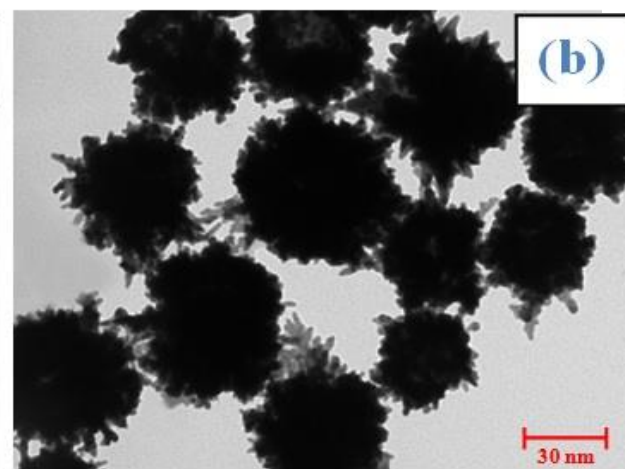
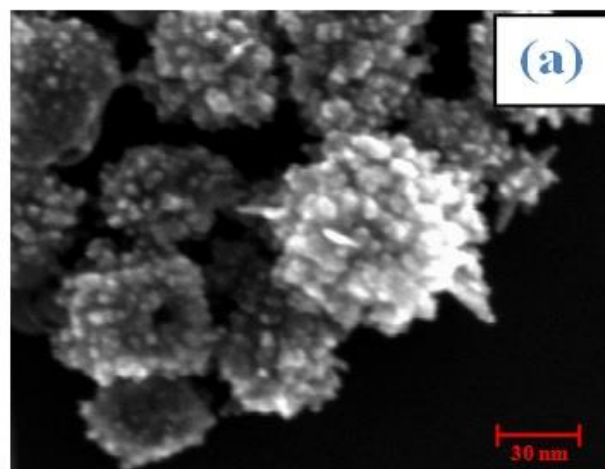
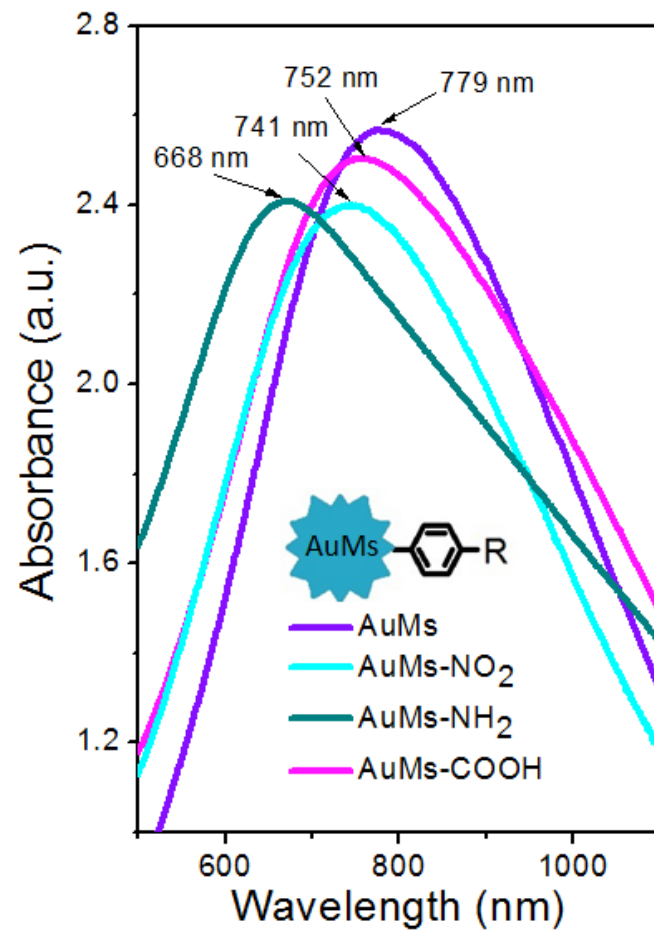
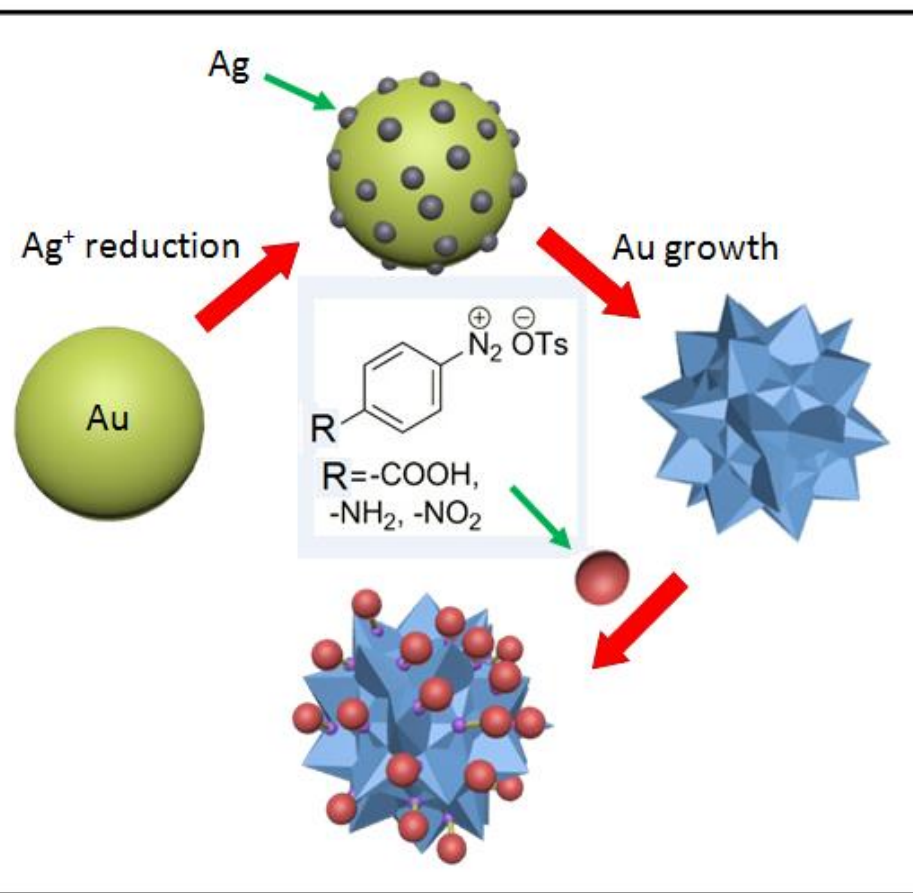


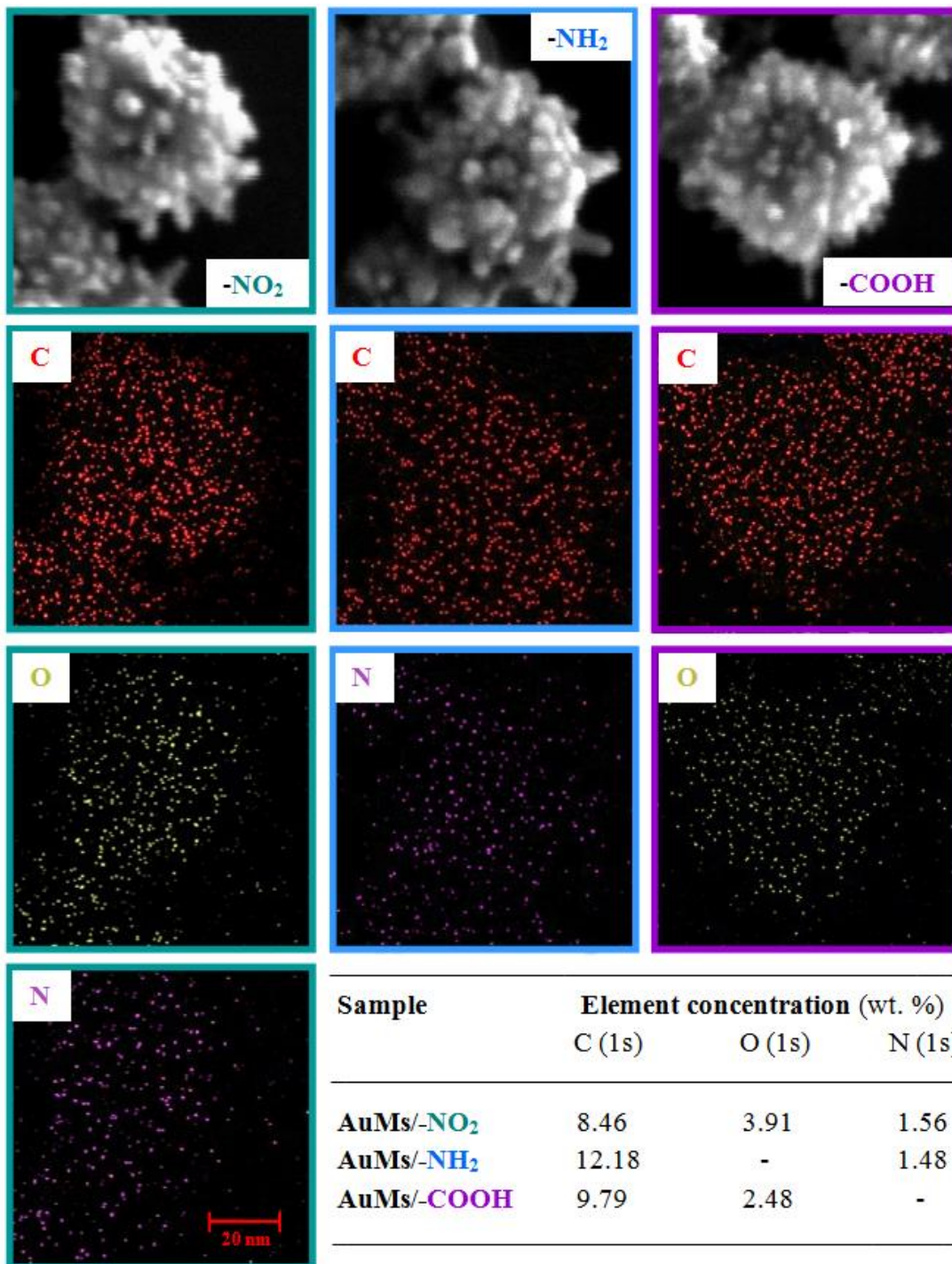
Bacterial resistance of biofilm

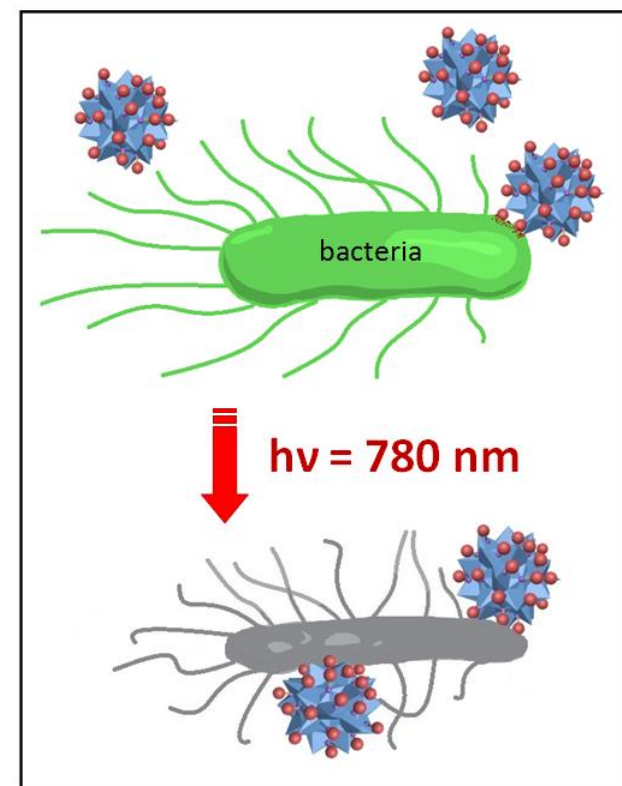
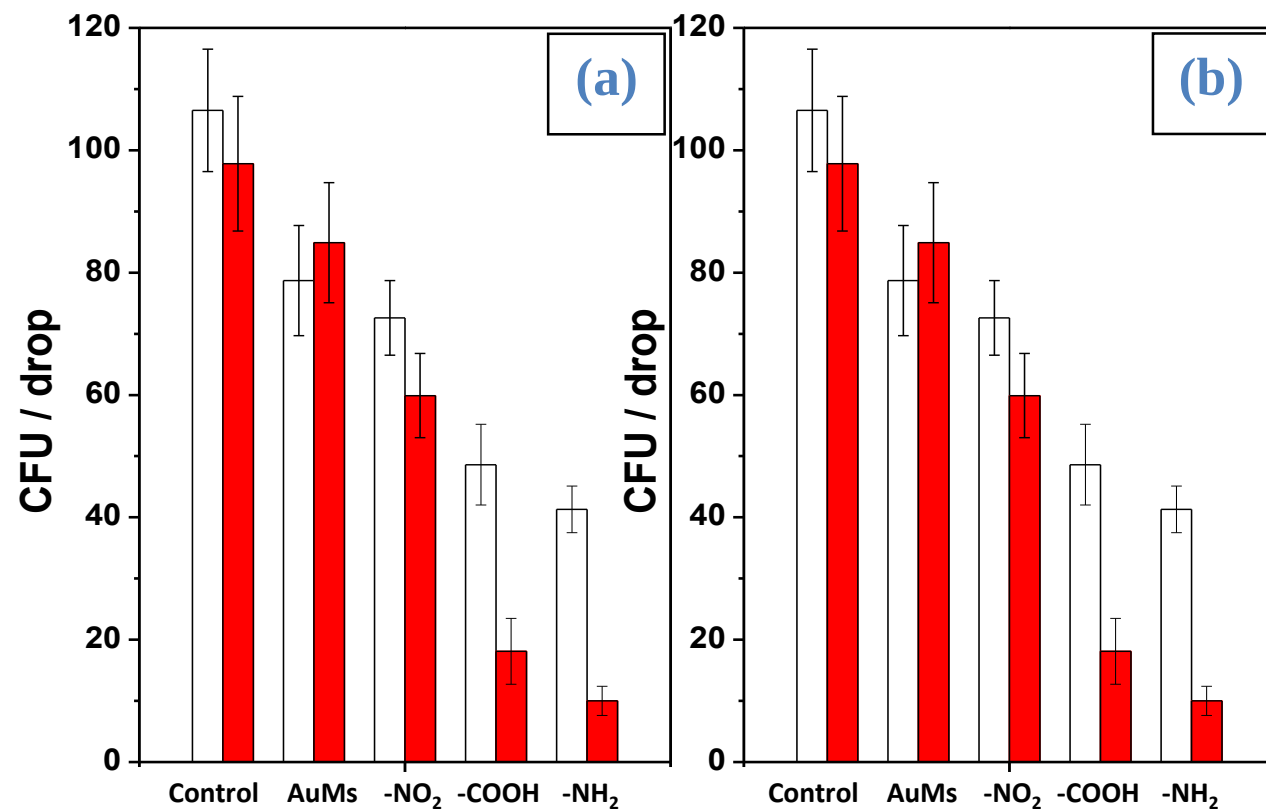


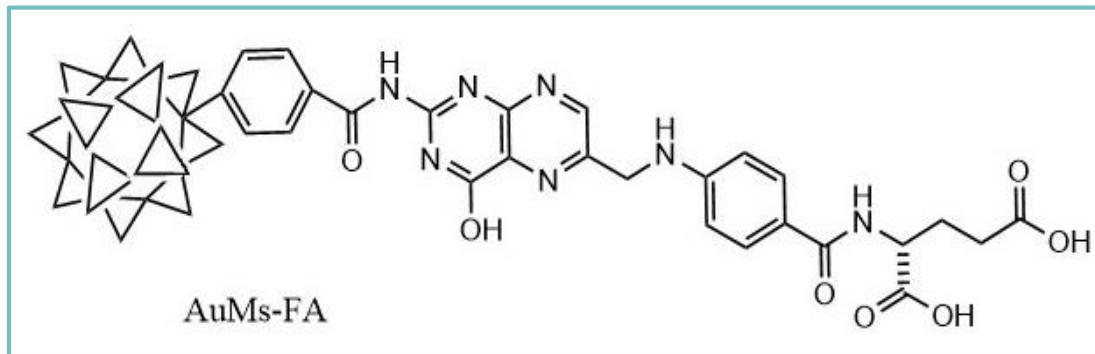
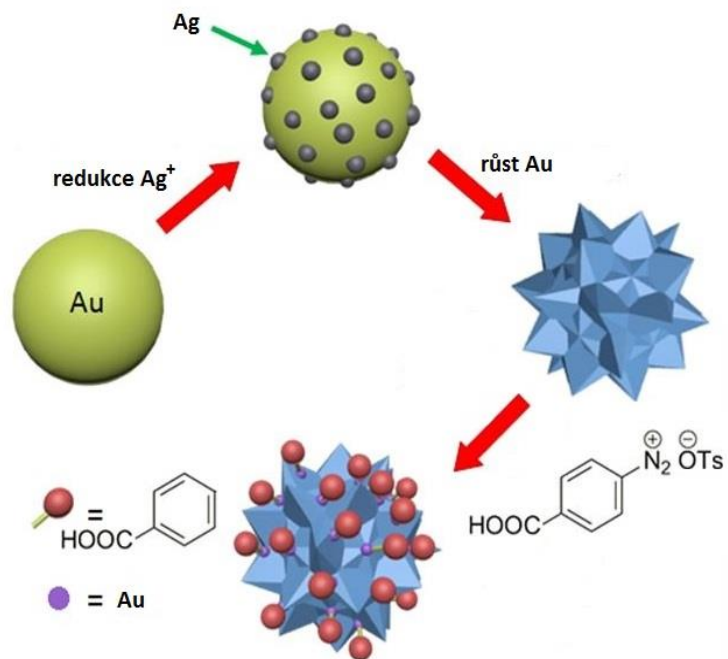
Multifaceted mechanisms of antibacterial action of silver ions.



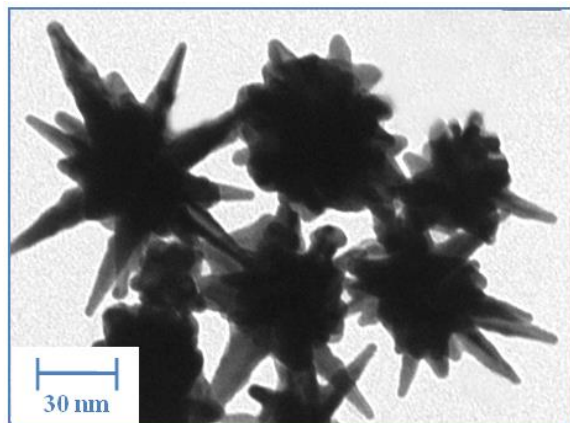




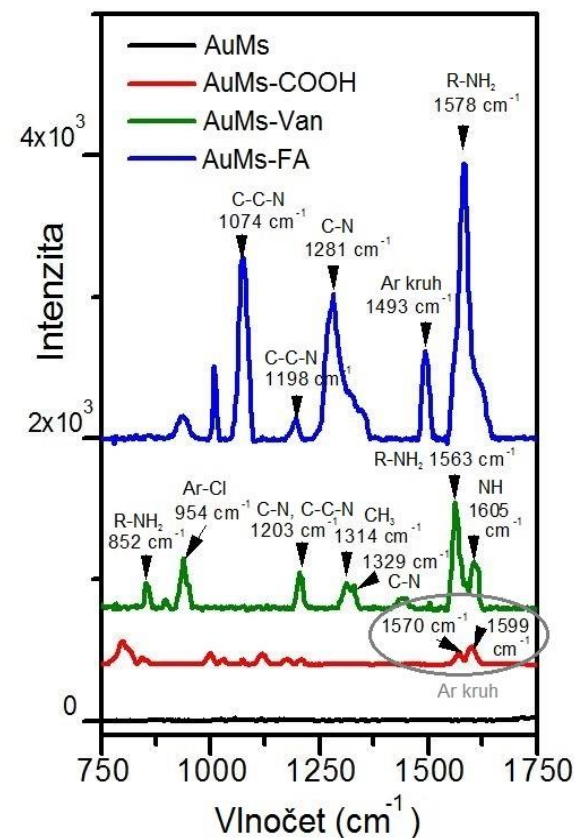




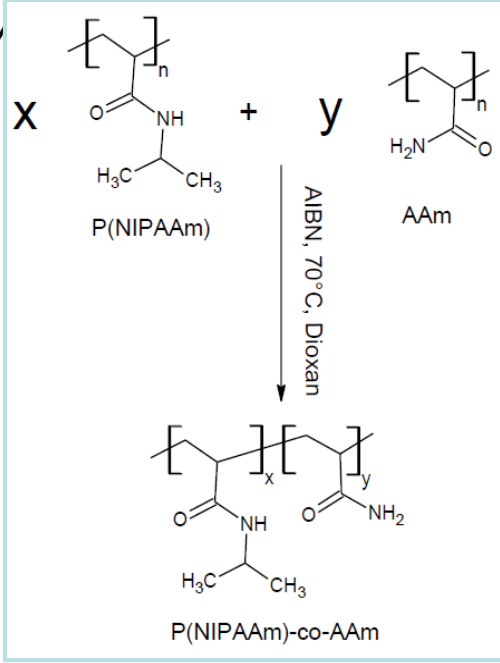
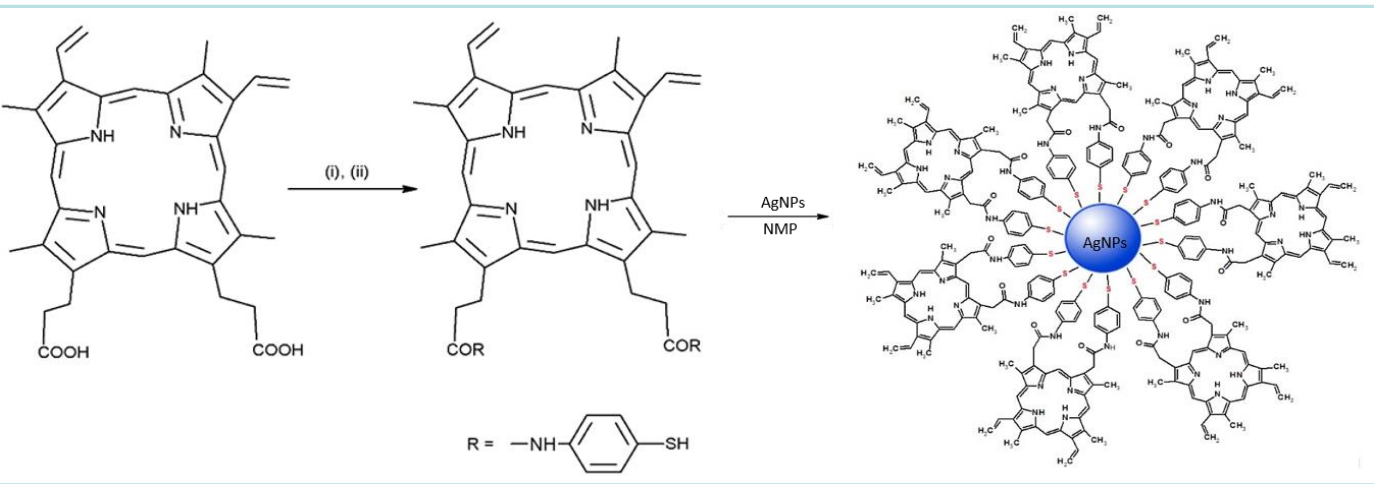
Kovalentně navázaná kyselina listová
(FA-folic acid, léčba nádorů, antibakteriální infekce)



Y.Kalachyova, A.Ishtrem, O.A.Guselnikova,
P.S.Postnikov, R.Elashnikov, P.Ulbrich
V.Svorcik, O.Lyutakov, Chem. Open 6, 254-
260 (2017)



AgNPs – průnik do buňky, interakce s bílkoviny+DNA
Porhyrin – při ozáření produkují ROS (Reaktivní formy kyslíku)
AgNPs-porhyrin – synergický účinek obou složek ???
AgNPs-porhyrin/polymer – rozpustnost řízení teplotou a nebo pH ??? (36-37 vs. 32°C)



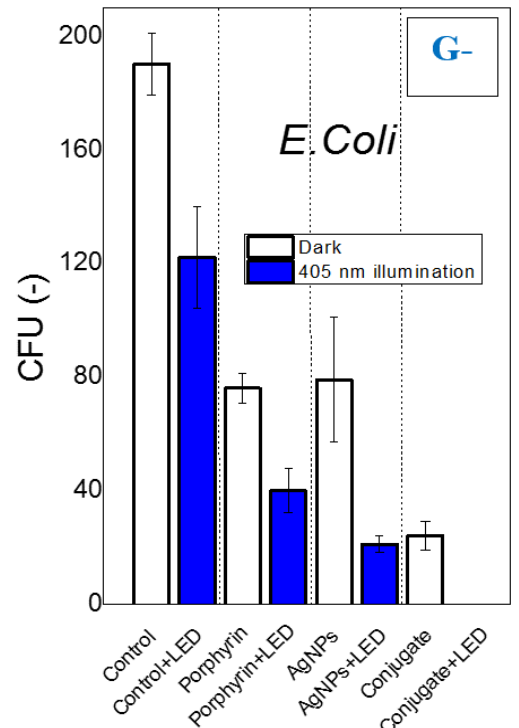
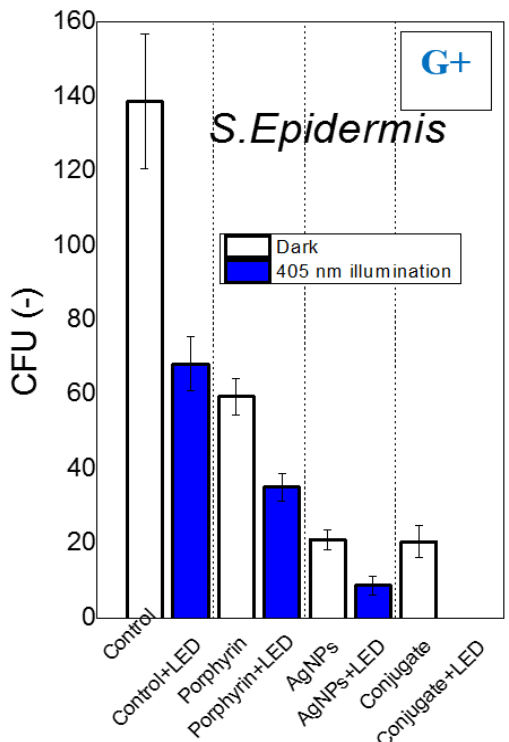


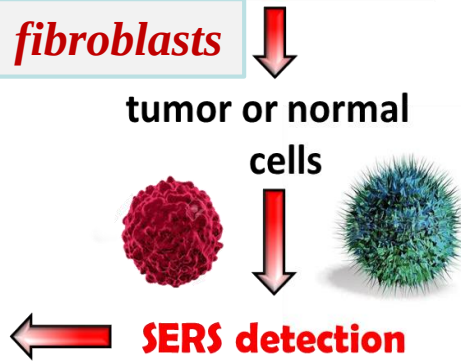
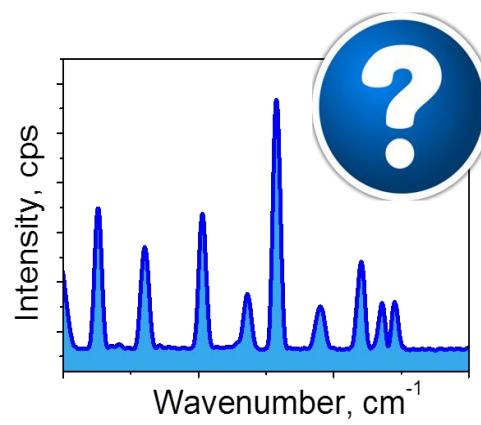
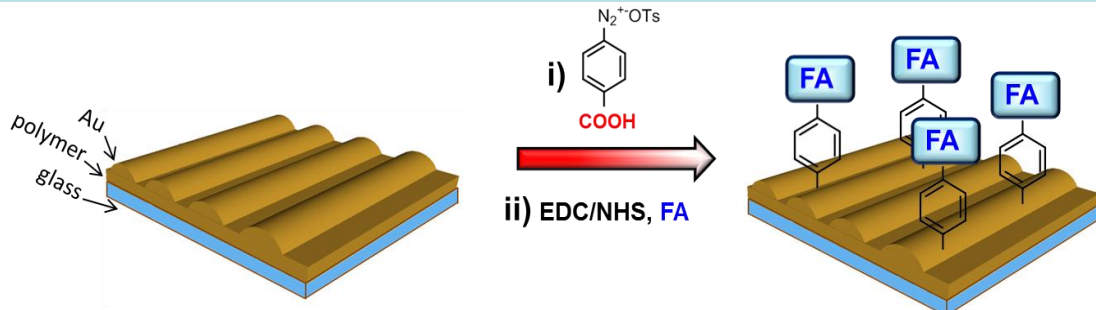
Bakterie množení.mp4



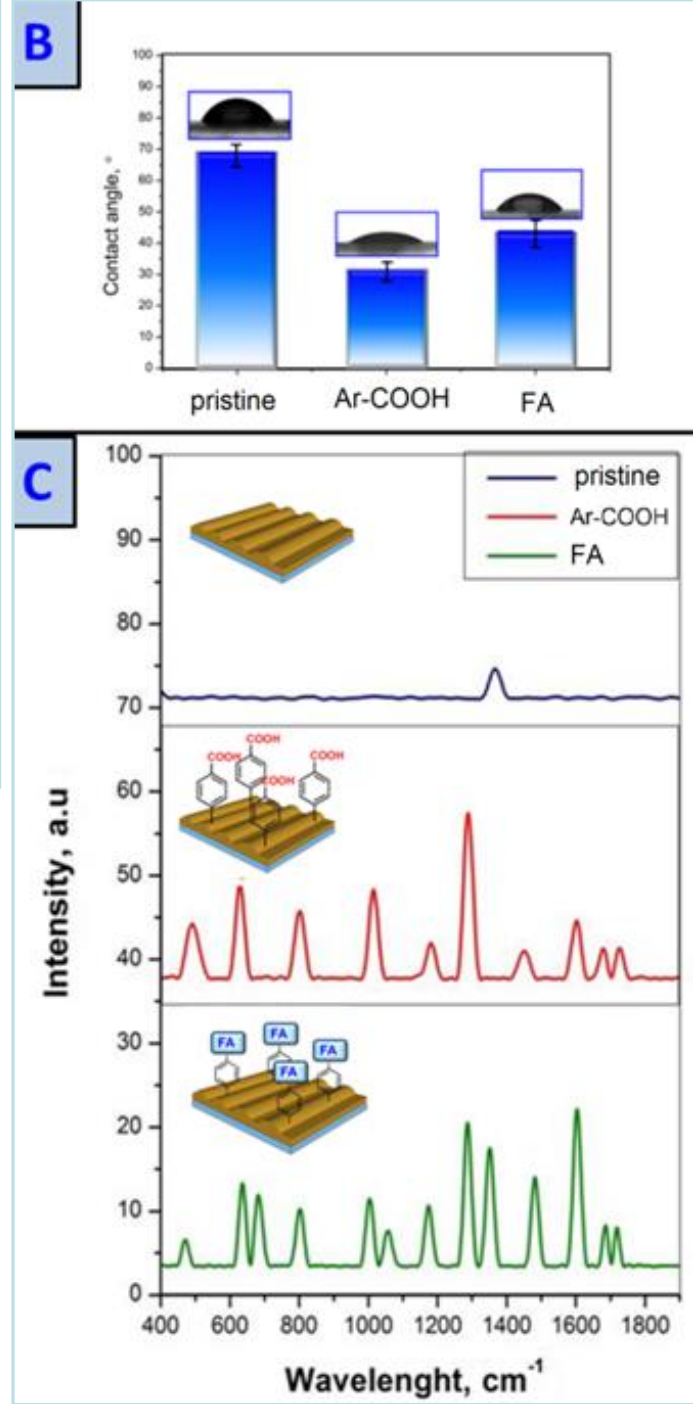
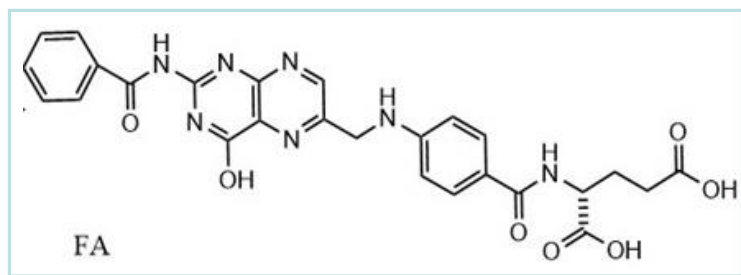
Bunka mezi bakteriemi.mp4

R.Elashnikov, M.Radocha, I.Panov, S.Rimpelova, P.Ulbrich, A.Michalcova, V.Svorcik, O.Lyutakov, Mater. Sci. Eng. C 102, 192-199 (2019).

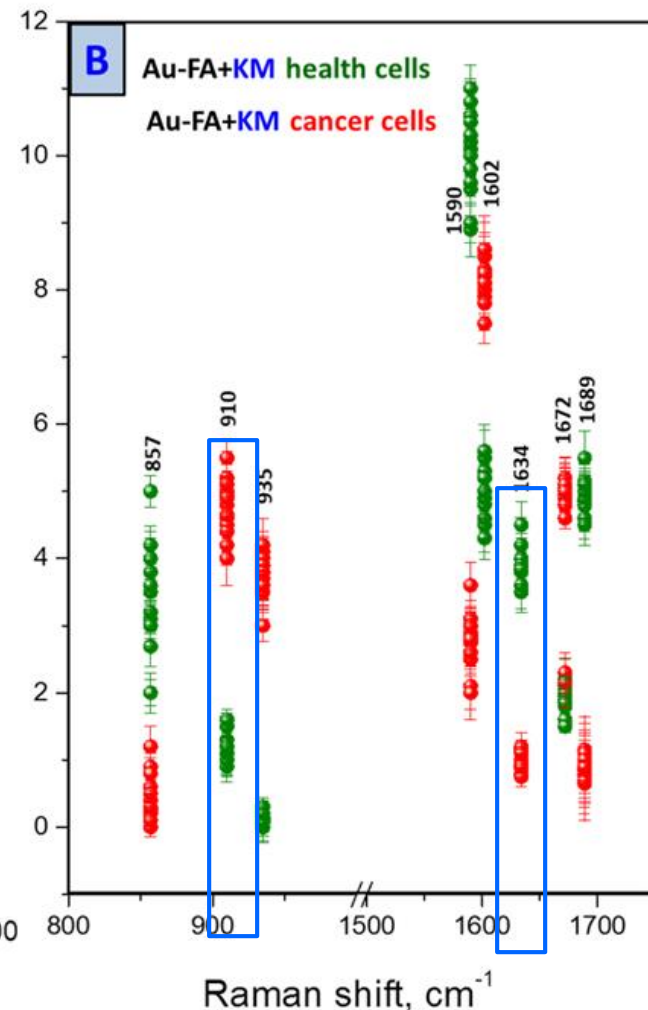
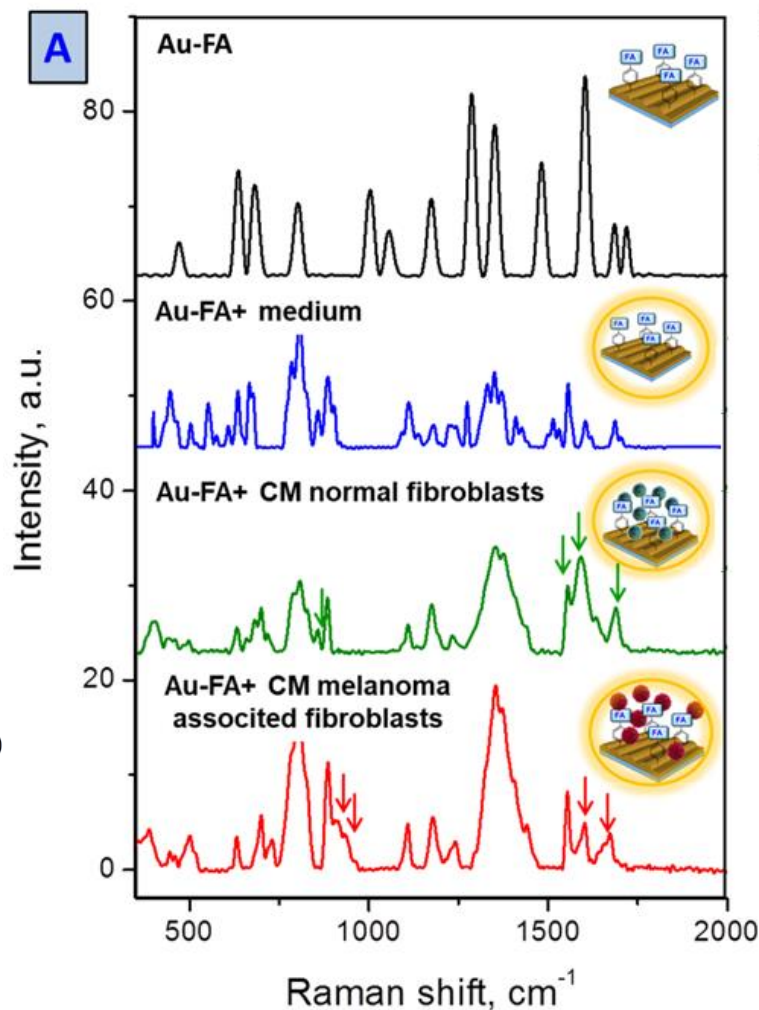
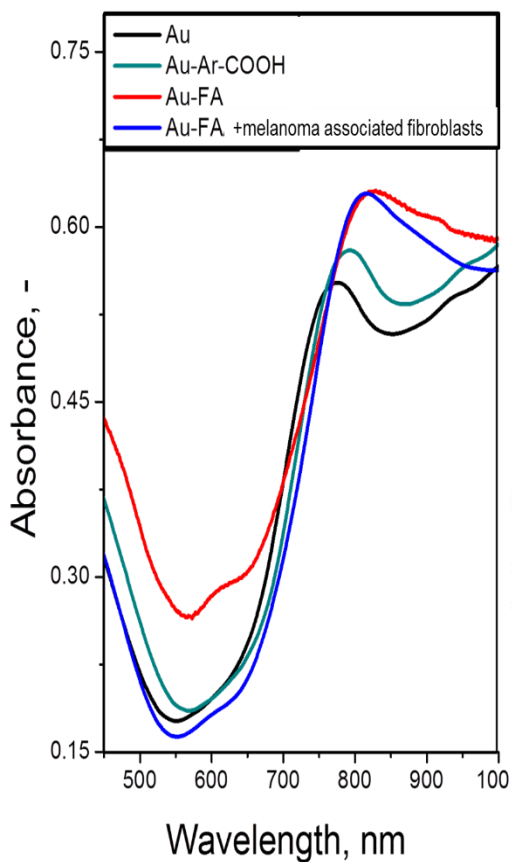


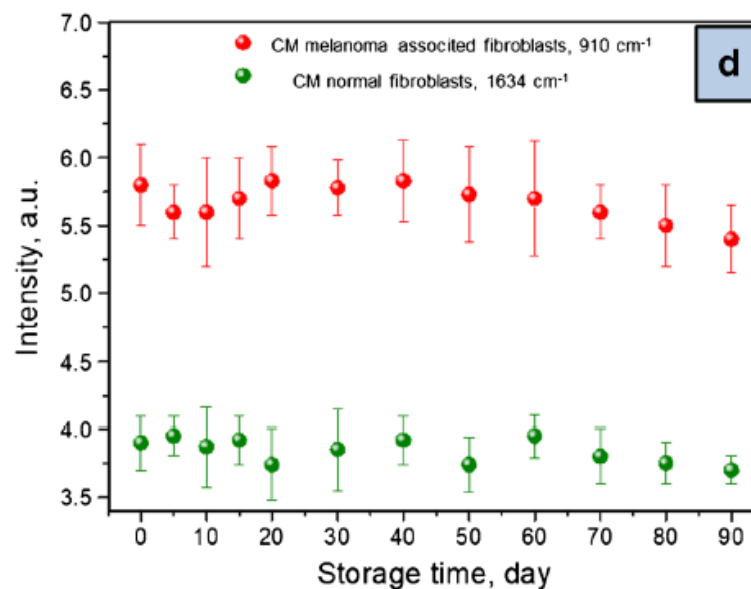
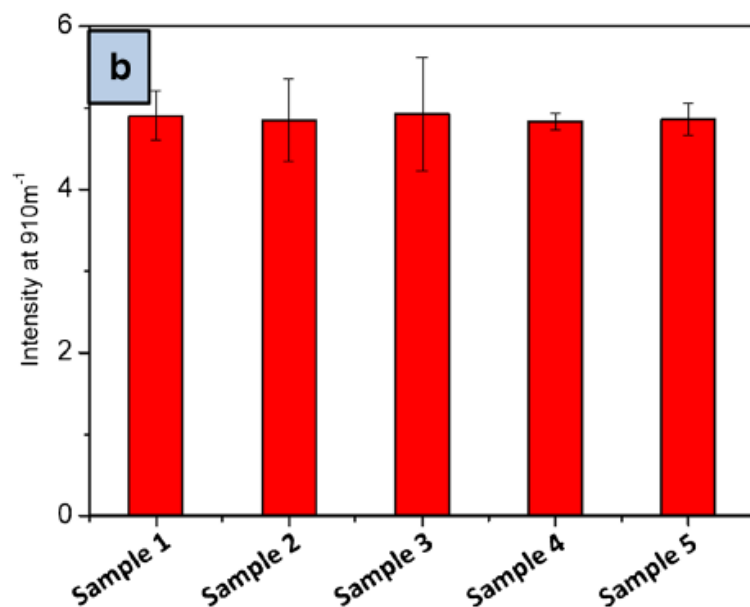
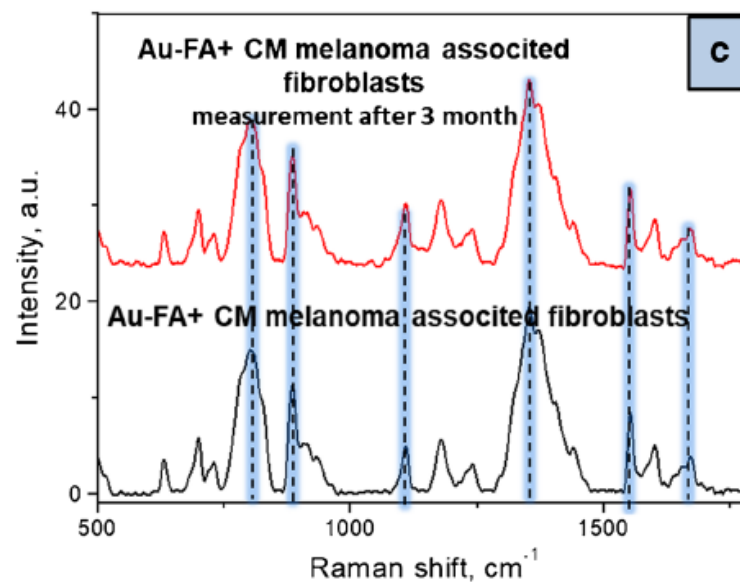
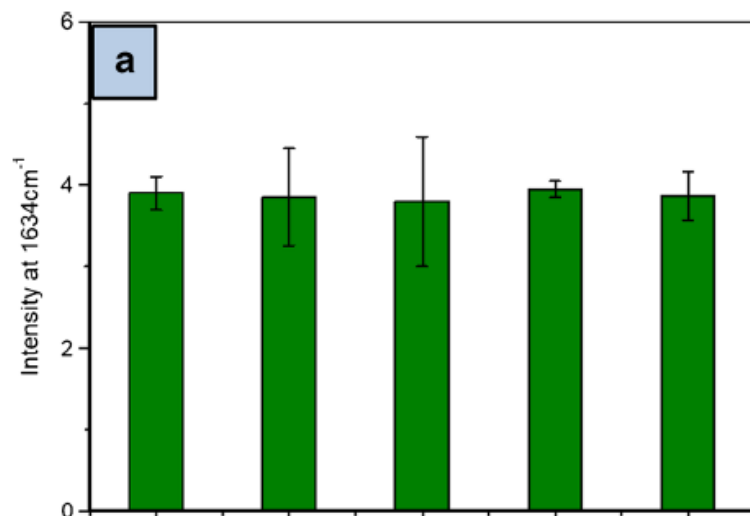


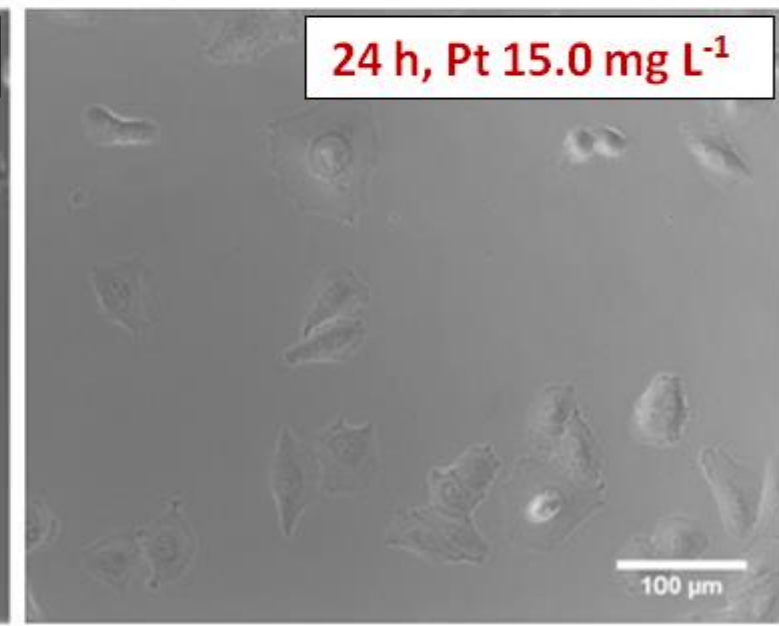
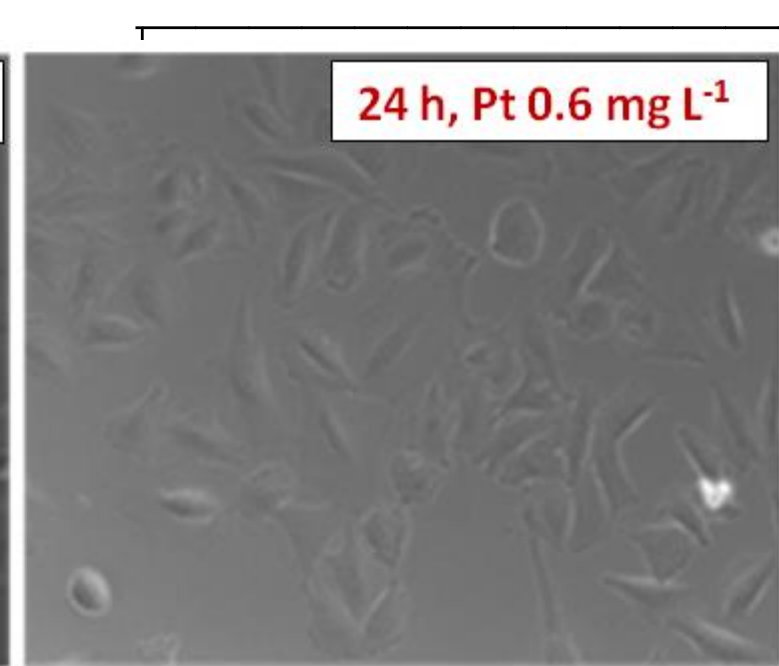
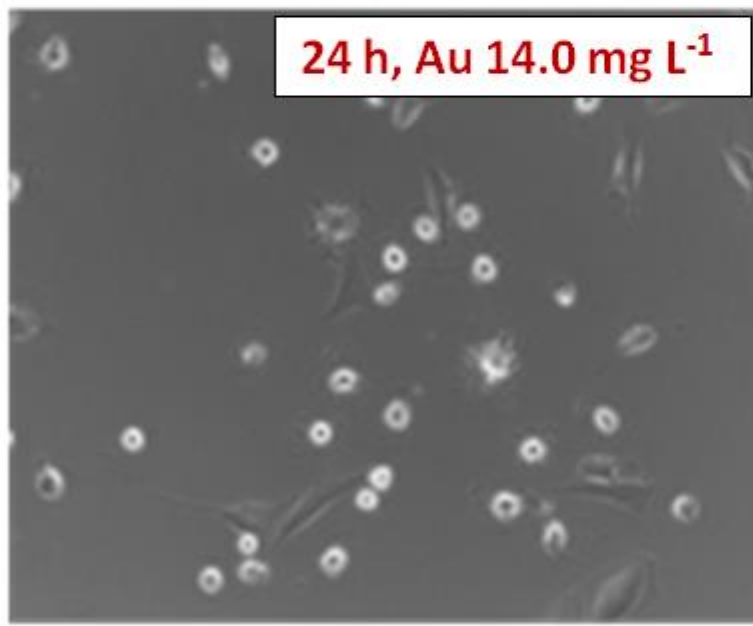
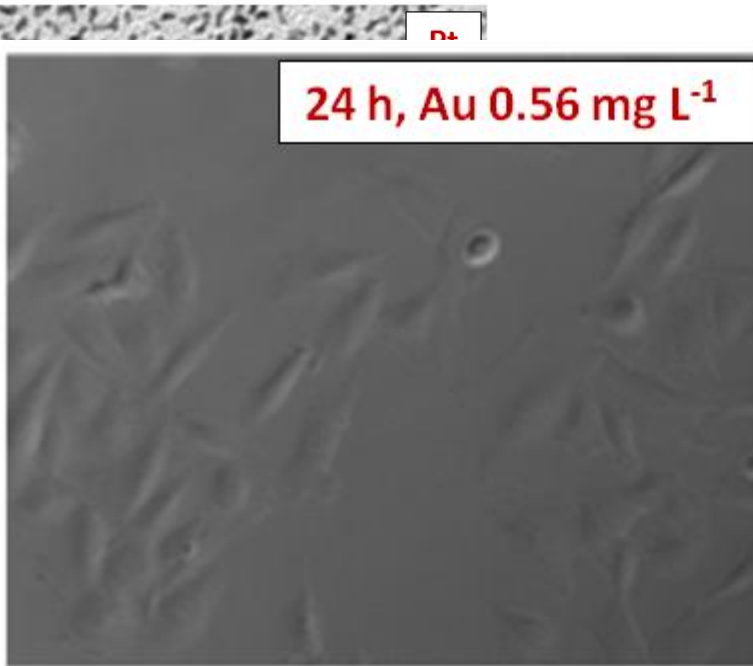
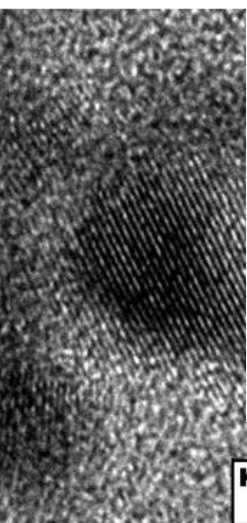
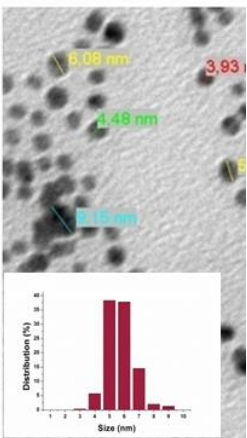
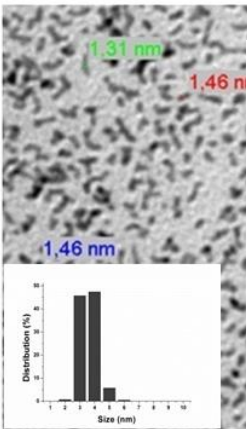
folic acid (FA)



O.Guselnikova, B.Dvorankova, K.Kakisheva, Y.Kalachyova,
 P.Postnikov, V.Svorcik, O.Lyutakov, Anal. Bioanal. Chem. .
 411, 3309-3319 (2019).





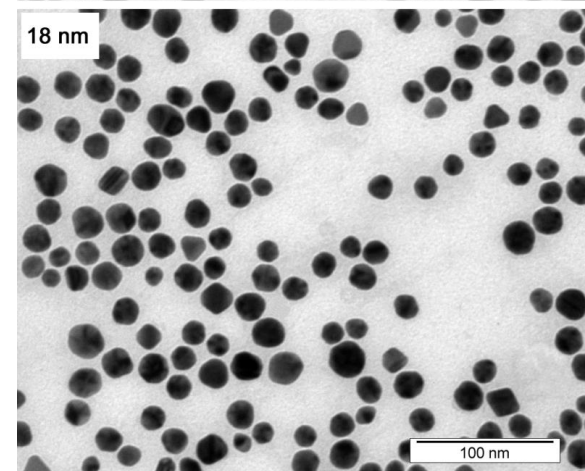
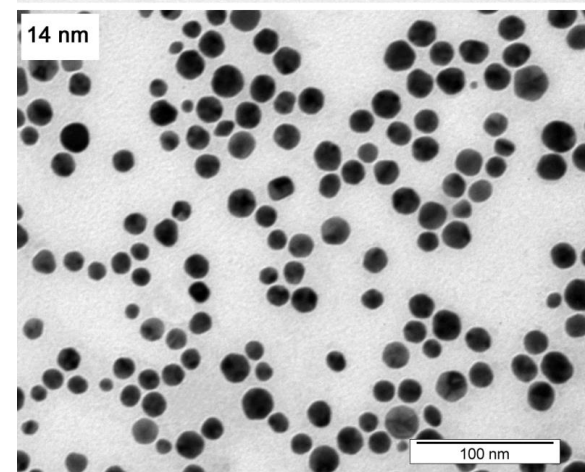
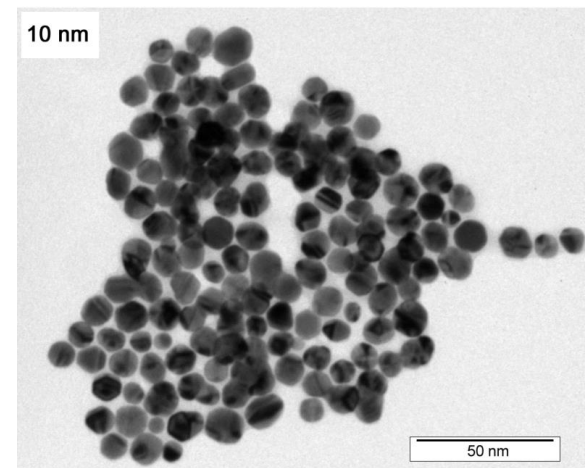
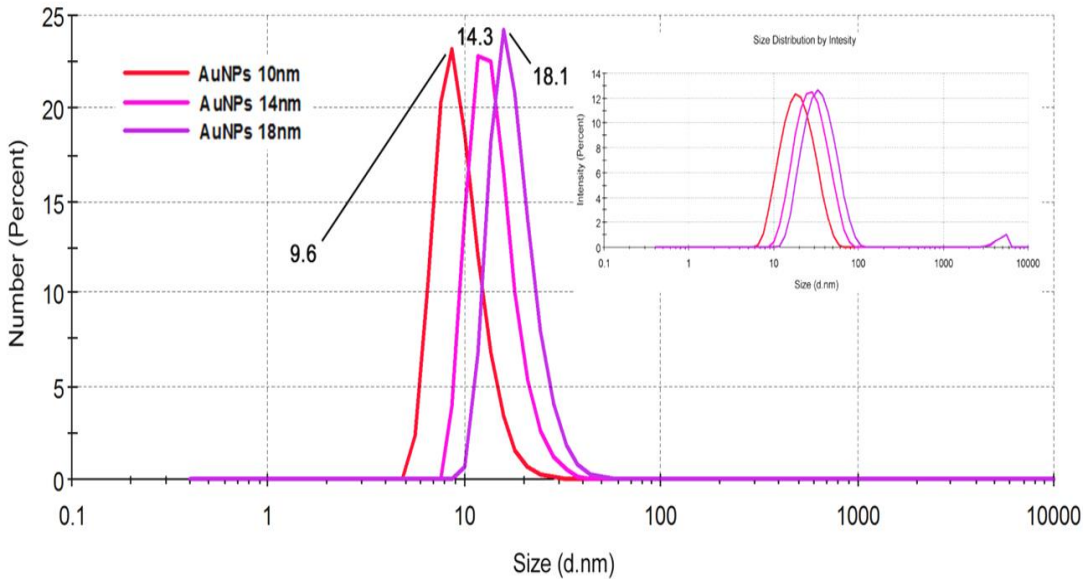
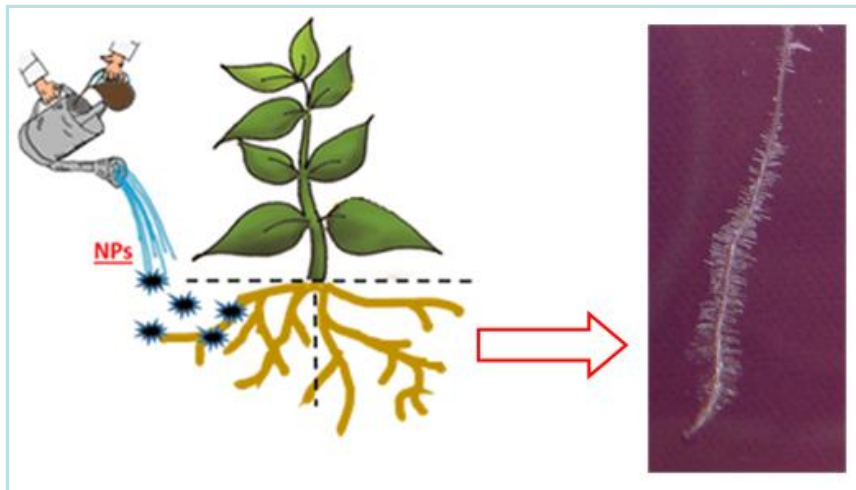


Nanomater. Bios. 13, 1035-1044 (2018).

AuNPs vs. řepka

délka kořene vs. velikost NPs

tvar kořene vs. koncentrace

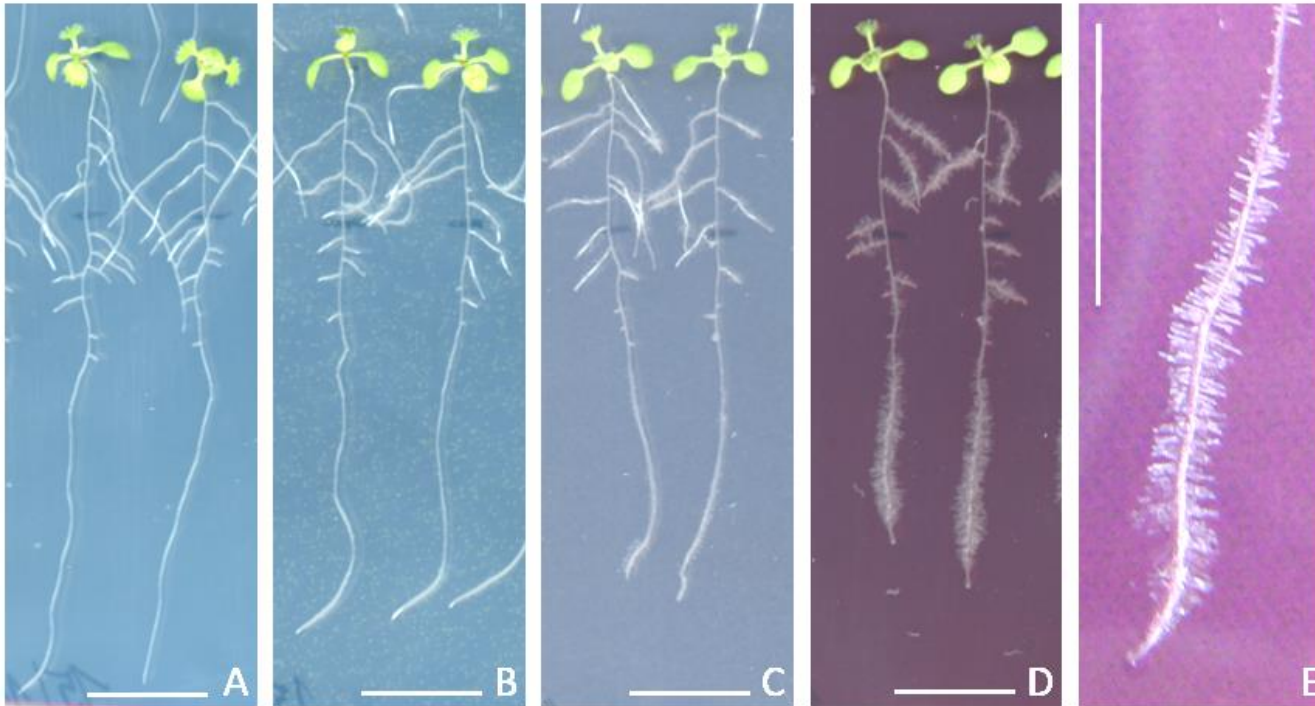


J.Siegel, K.Záruba, J.Martinec, L.Burkertová,
V.Svorcik, Nanoscale Res. Lett. 13, 95, 1-7 (2018).

AuNPs vs. řepka
růst (10 nm) vs. 0-4 týdny



AuNPs vs. řepka
délka kořene vs. velikost NPs
tvar kořene vs. koncentrace



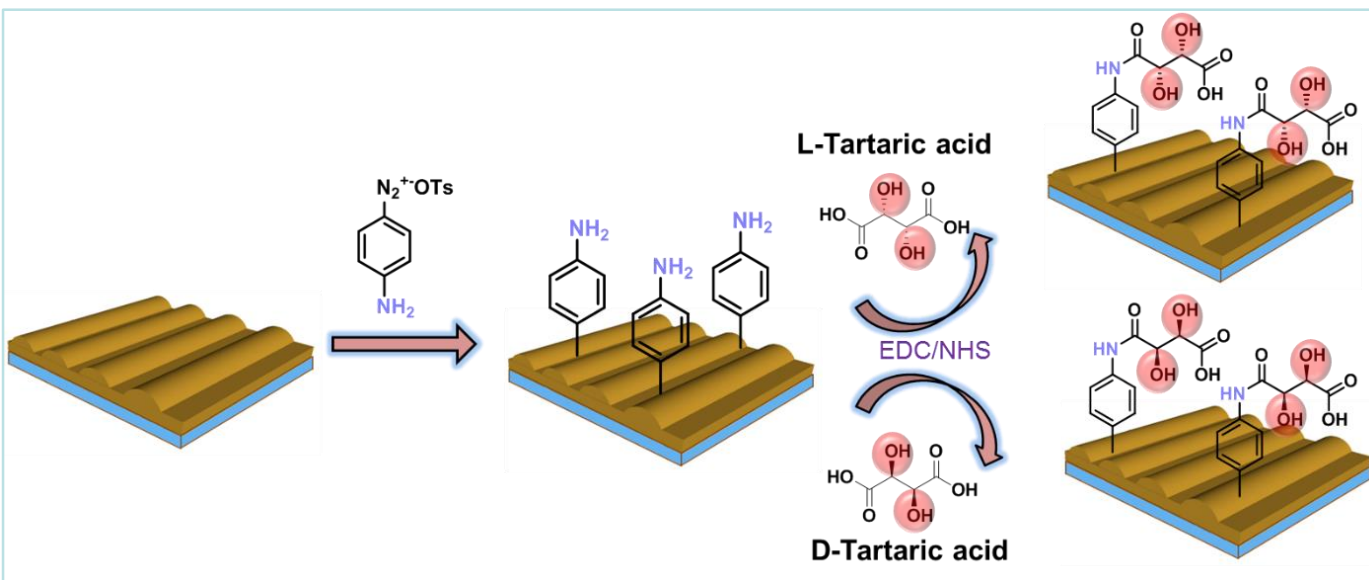
10 nm AuNPs

(A) Control
(B-D) 1, 10, 100 mg/L of AuNPs
(E) detail root hair growth in plant
exposed to 100 mg/L

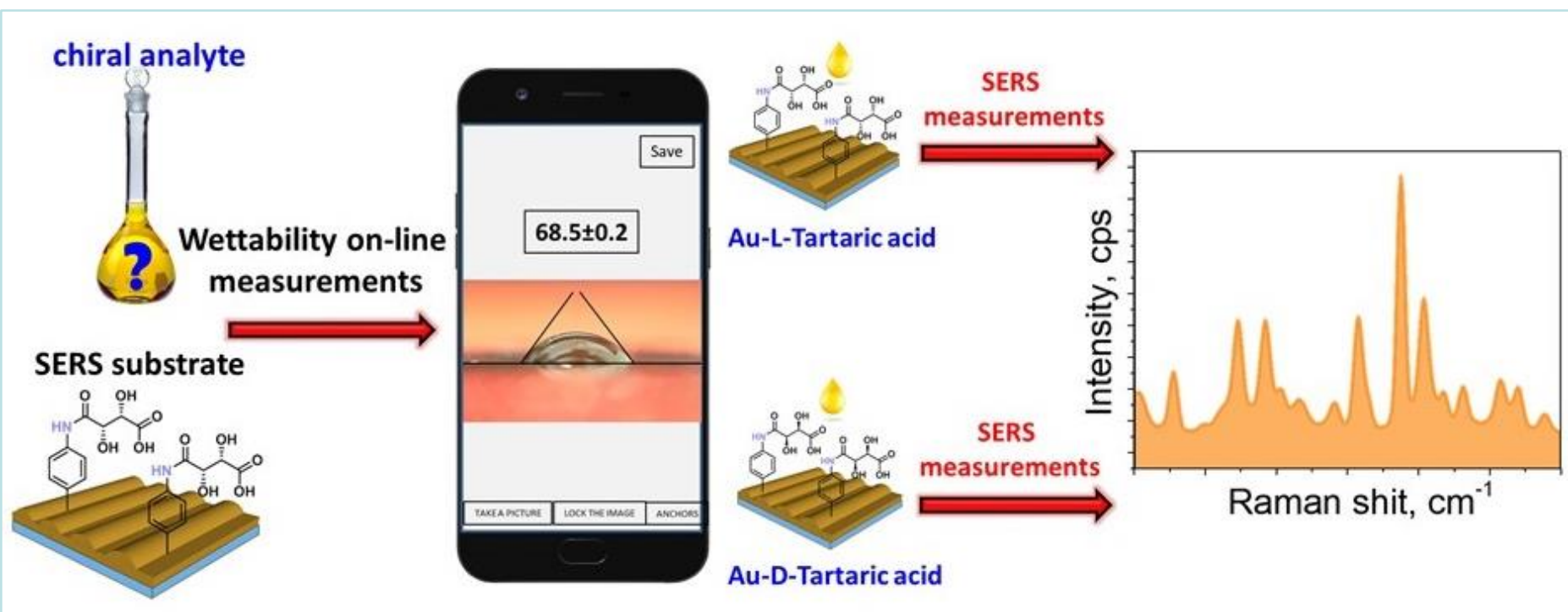
scale bars - 1 cm

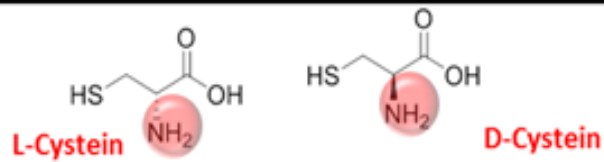
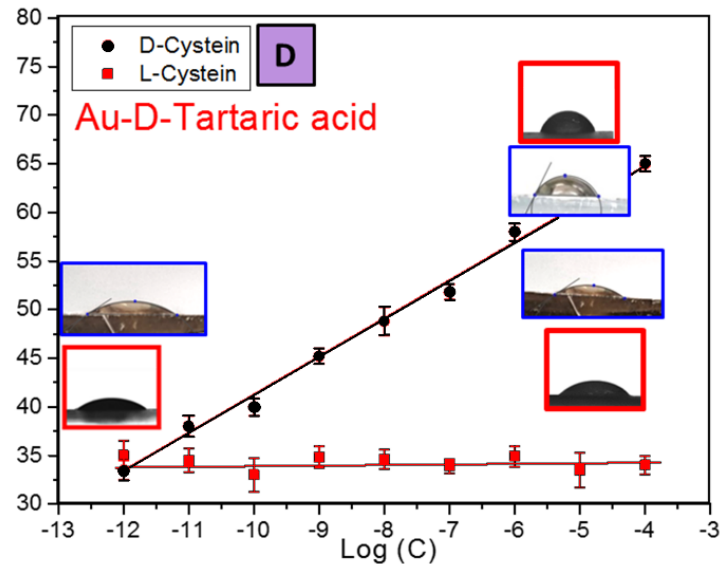
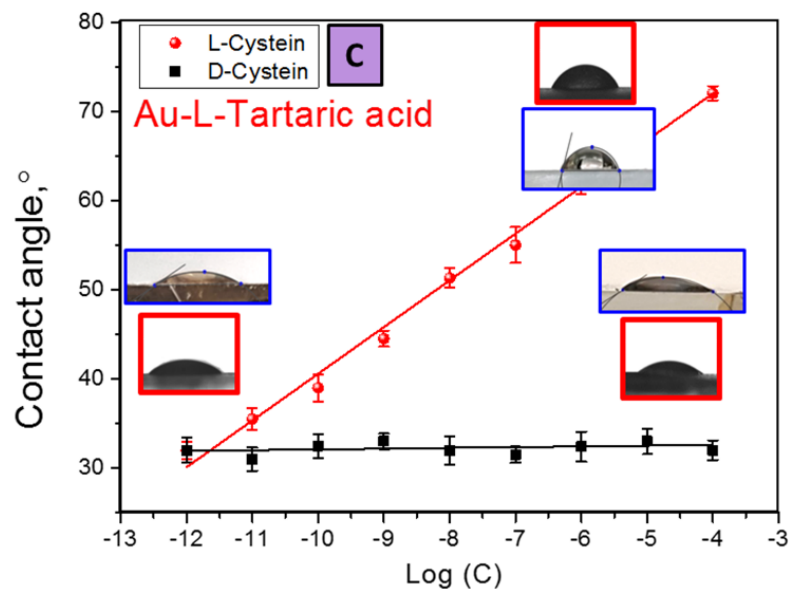
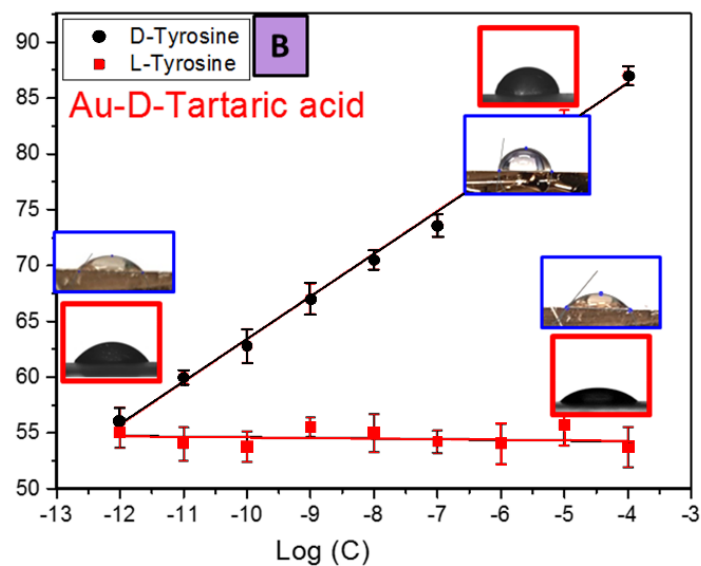
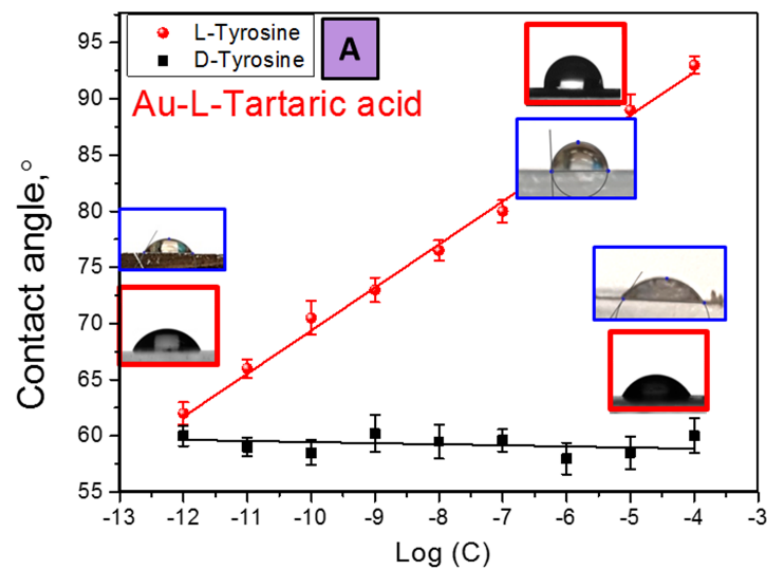
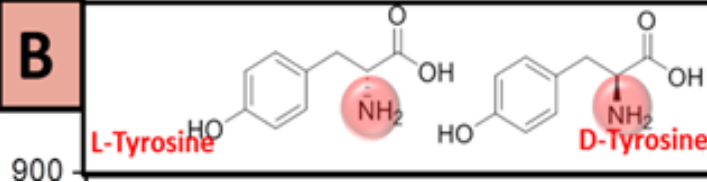
wettability (contact angle) - „studium“ mobilem a SERS

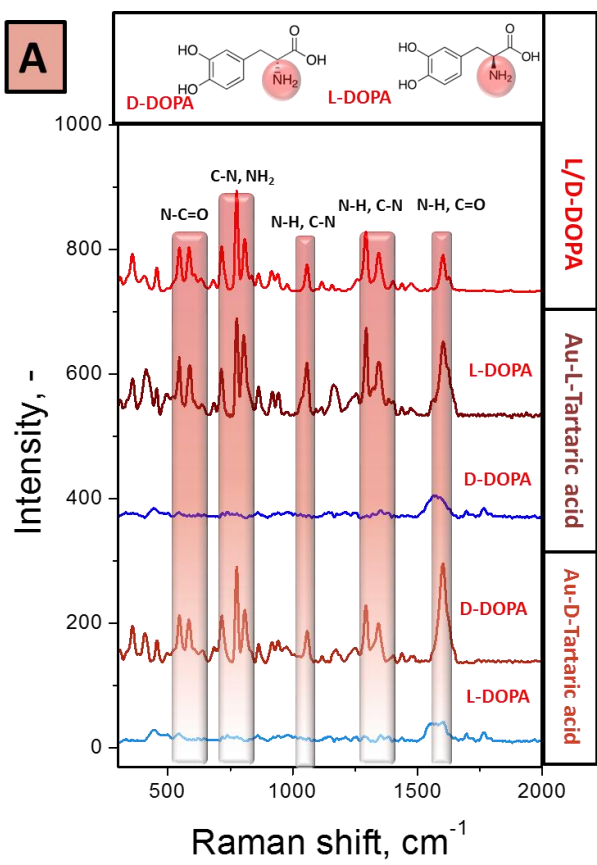
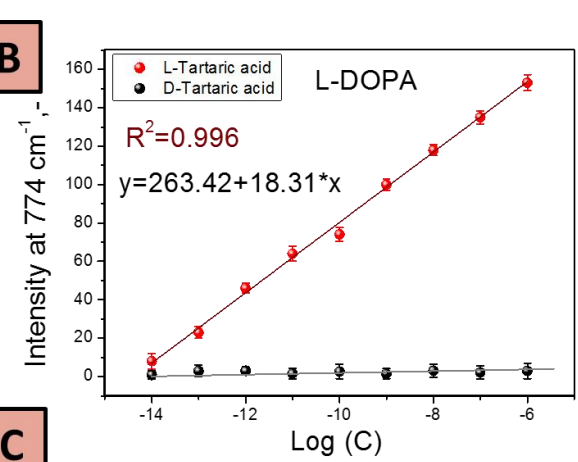
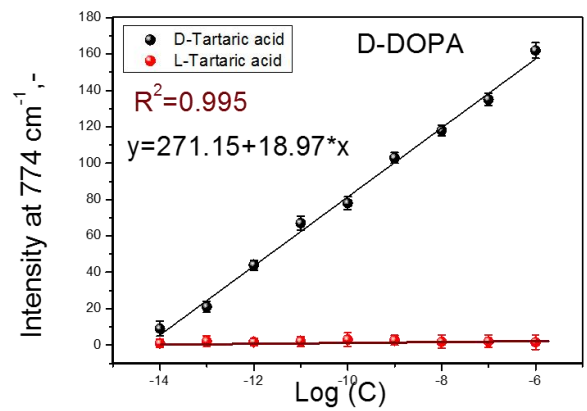
V.Švorčík, vaclav.svorcik@vscht.cz



O.Guselnikova, P.Postnikov, A.Trelin, V.Švorčík, O.Lyutakov, ACS Sensors 4, 1032-1039 (2019).



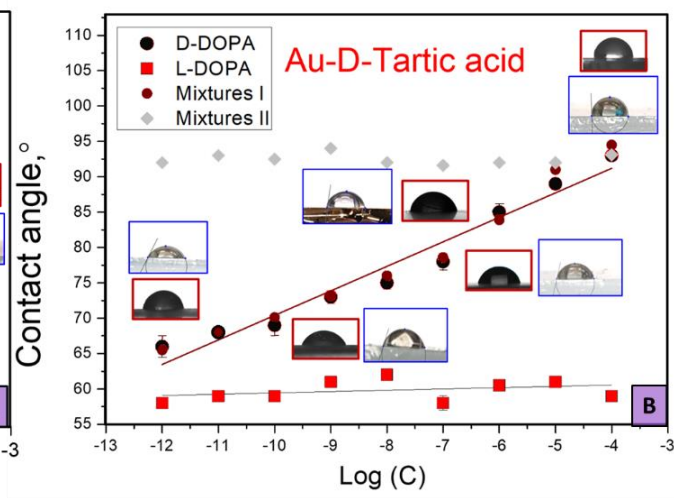
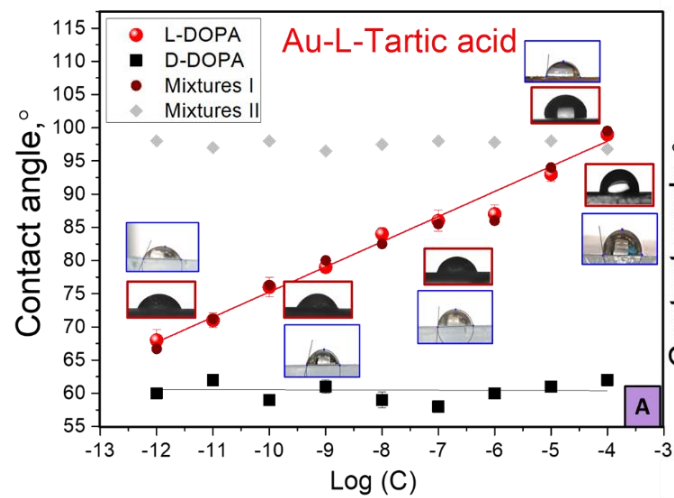
A**B**

A**B****C**V.Švorčík, vaclav.svorcik@vscht.cz

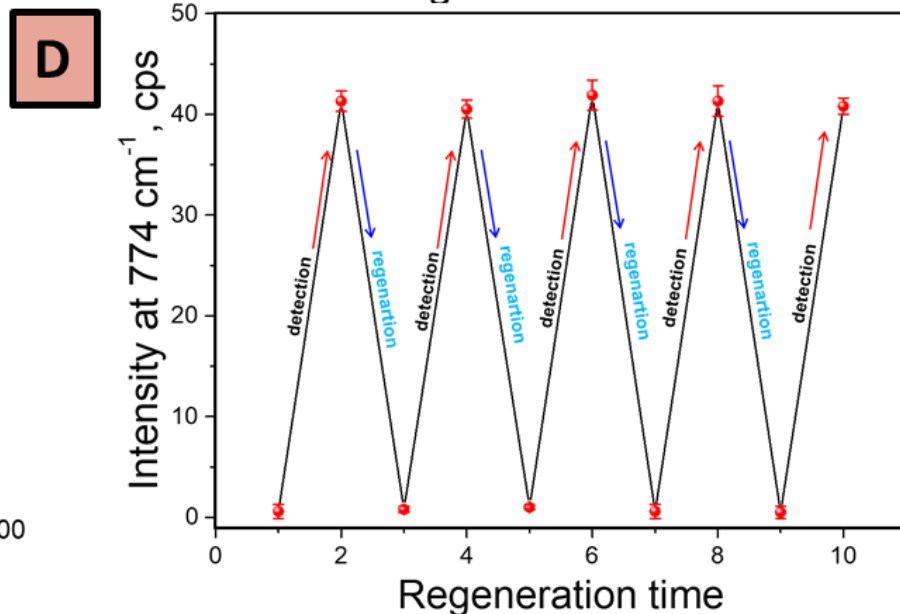
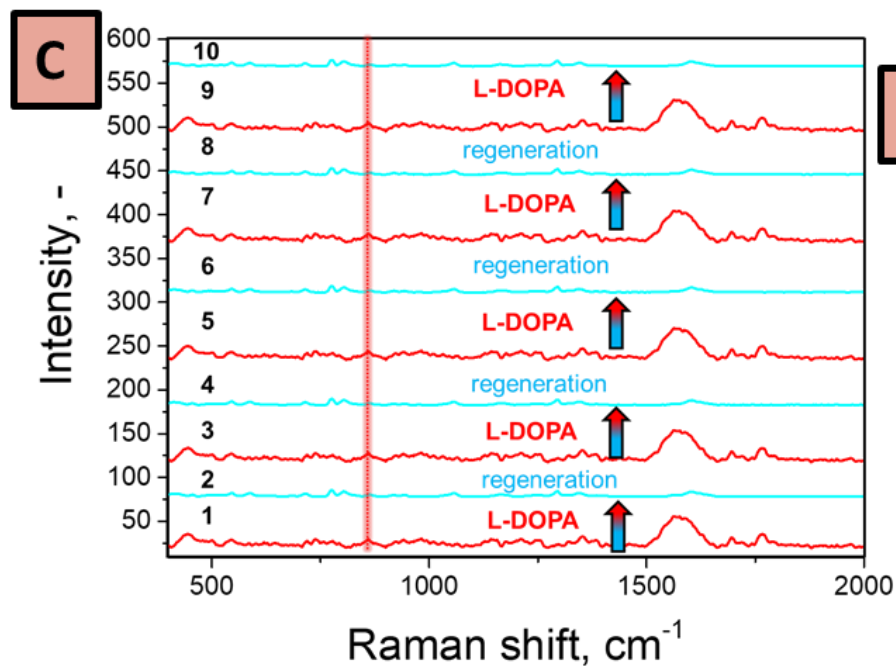
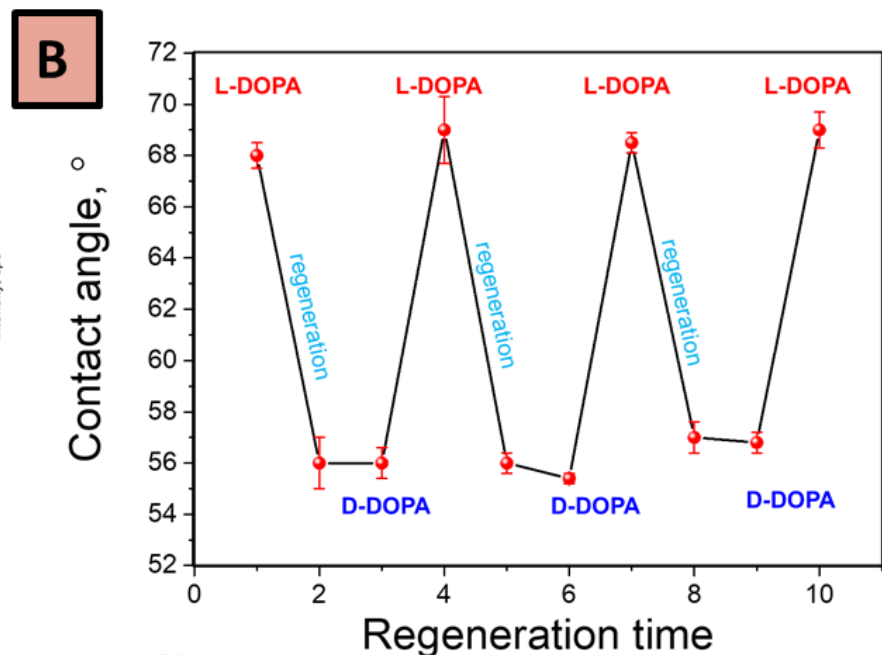
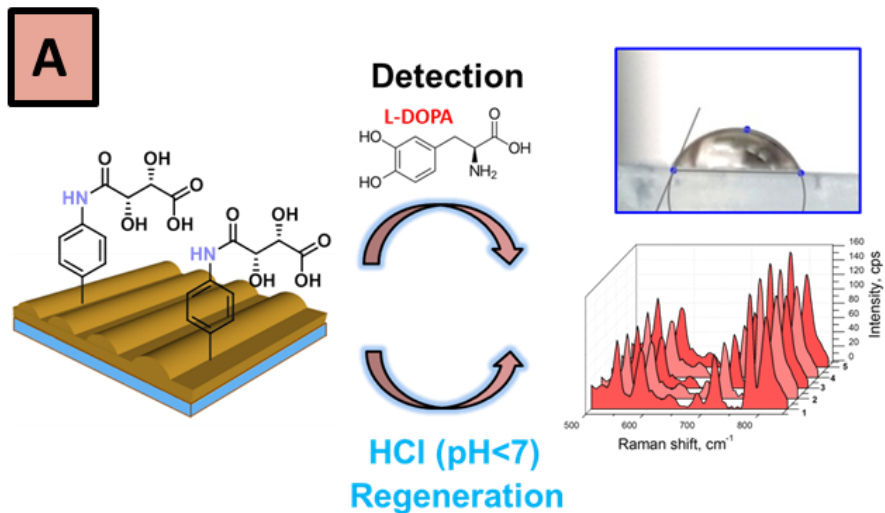
3-(3,4-dihydroxyphenyl)-
L(D)-alanine

(L(D)DOPA)

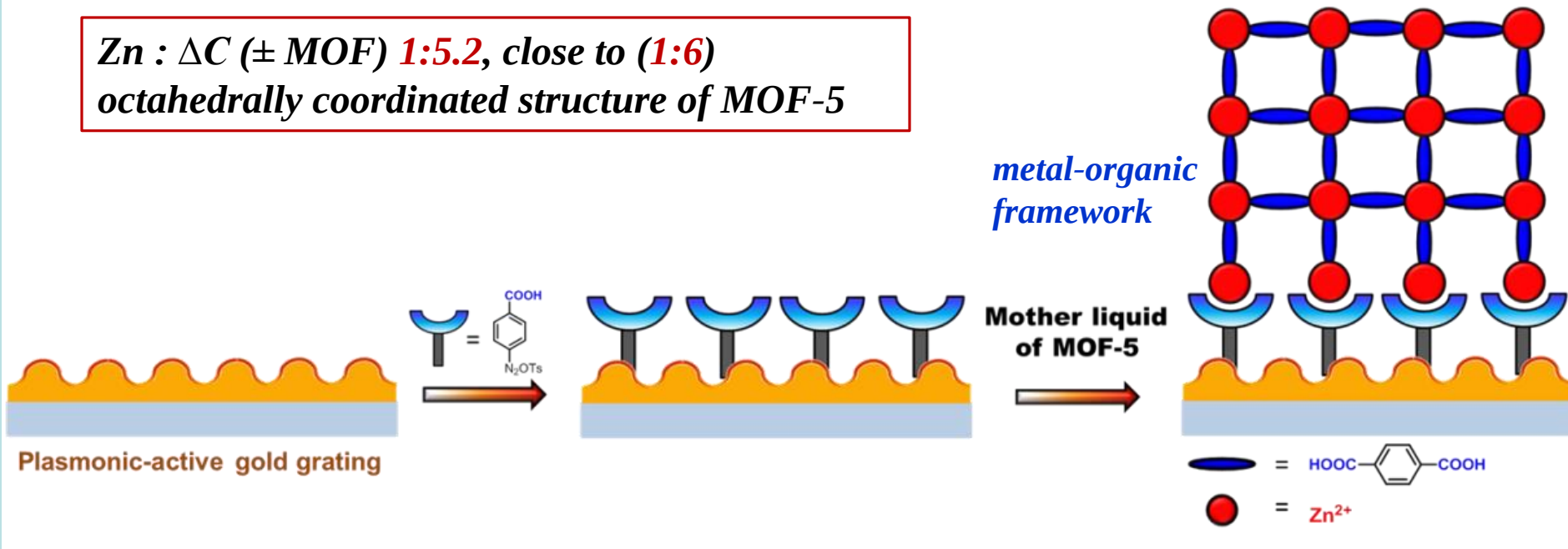
L-DOPA
lék na
Parkinsonovu
chorobu



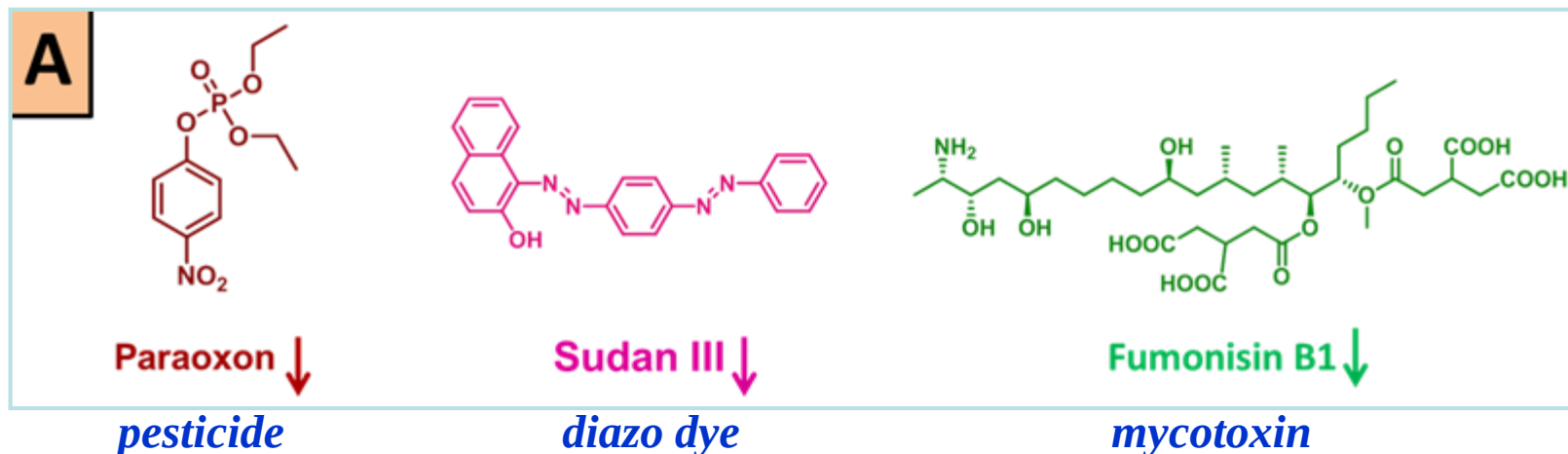
O.Guselnikova, P.Postnikov,
A.Trelin, V.Švorčík,
O.Lyutakov, ACS Sensors 4,
1032-1039 (2019).



Zn : ΔC ($\pm$ MOF) **1:5.2, close to **(1:6)**
octahedrally coordinated structure of MOF-5**



SERS vs. pesticidy v půdě



Au

Au-COOH

Au-MOF-5

A

500 nm

B

500 nm

C

500 nm

A

Au

500 nm

10 nm

500 nm

Ra=1.72

B

Au-COOH

500 nm

10 nm

500 nm

Ra=1.94

C

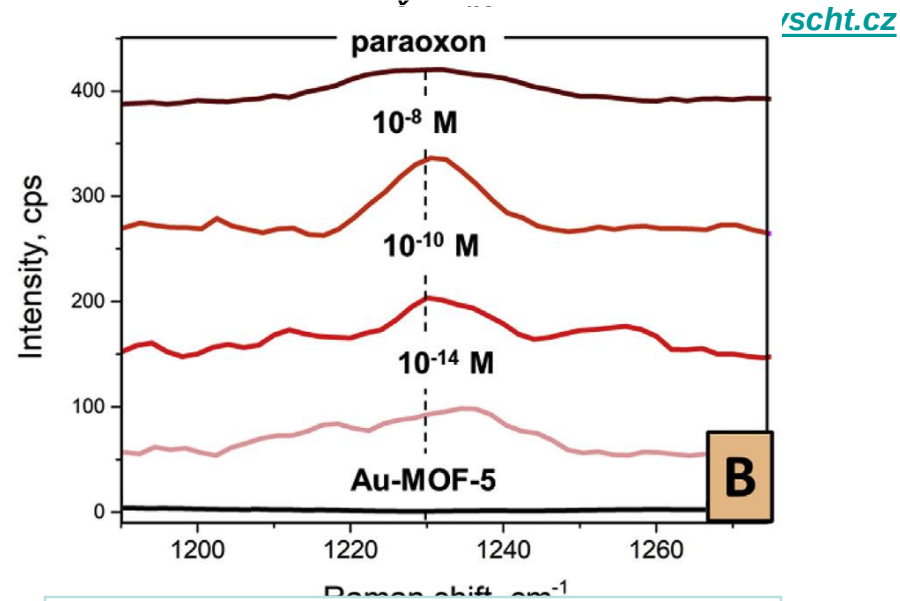
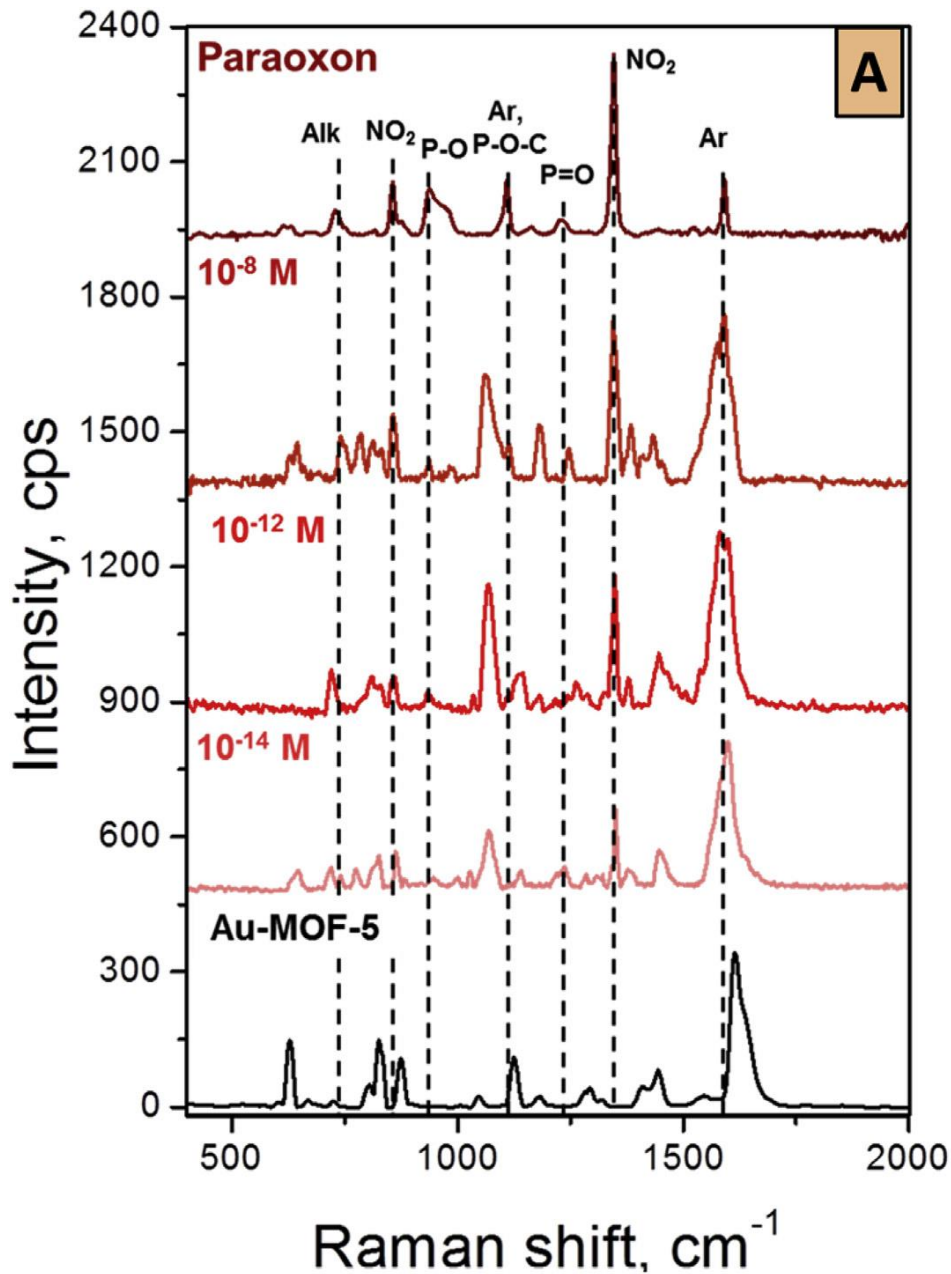
Au-MOF-5

500 nm

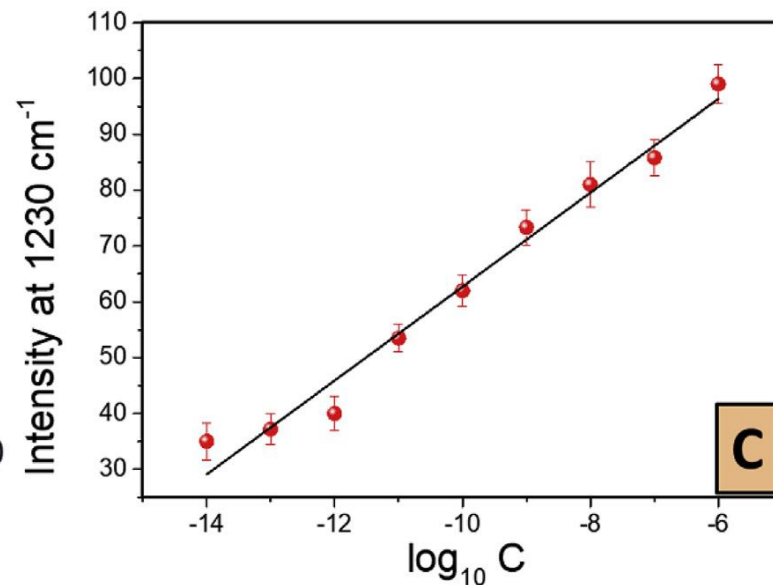
10 nm

500 nm

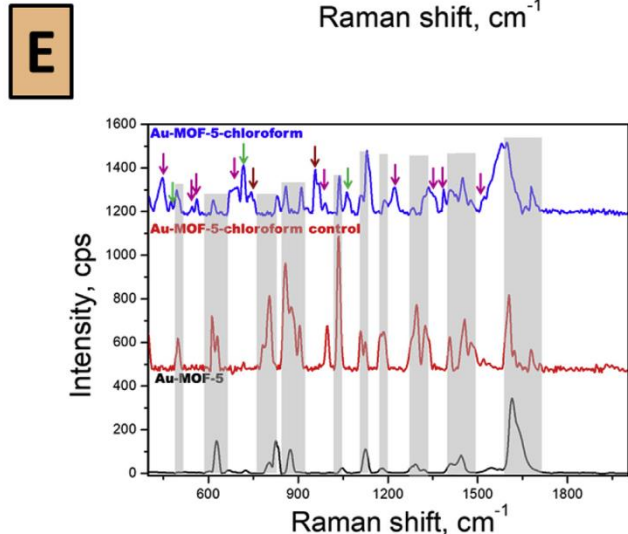
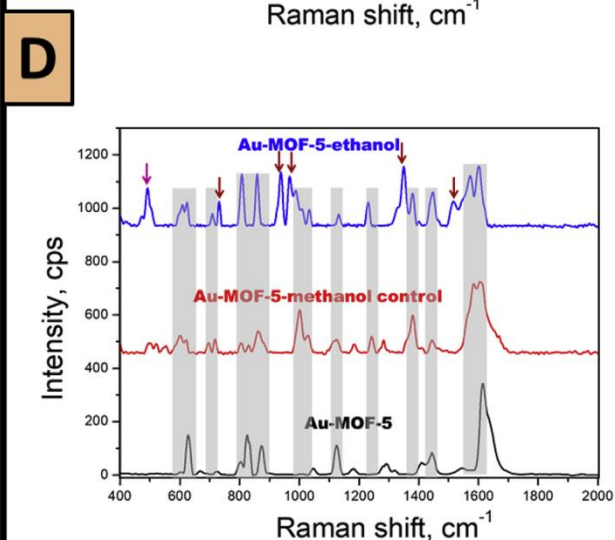
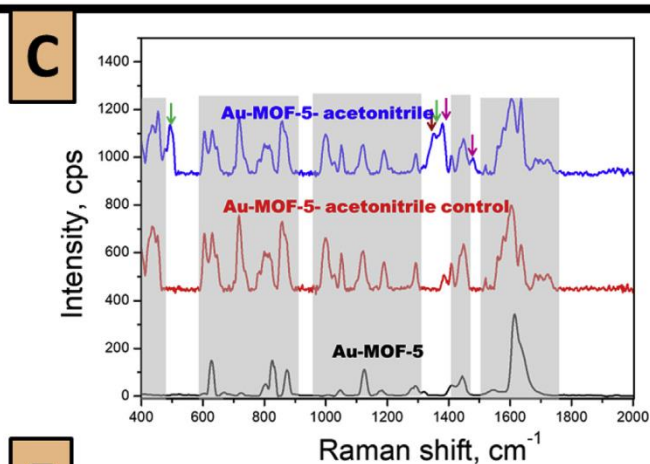
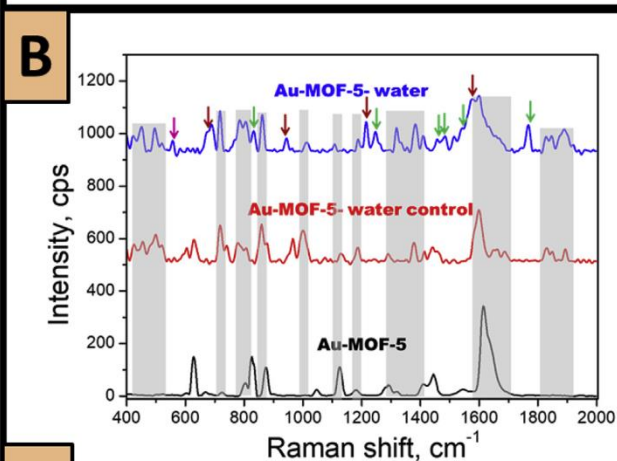
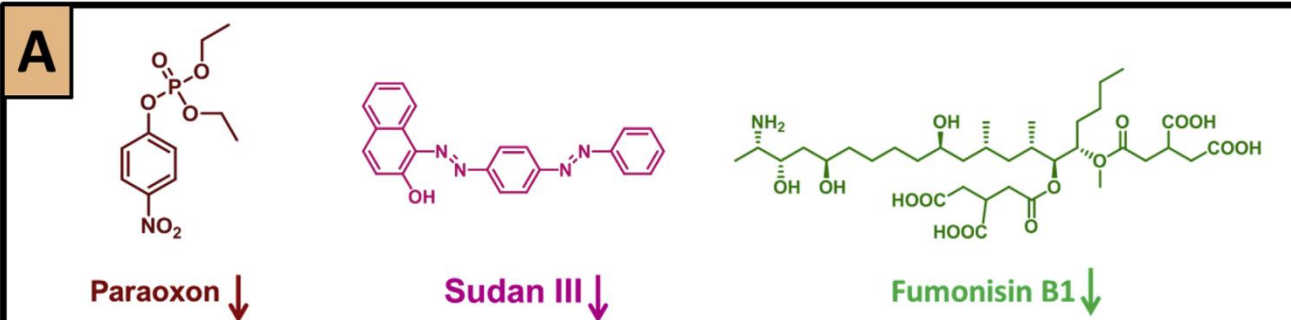
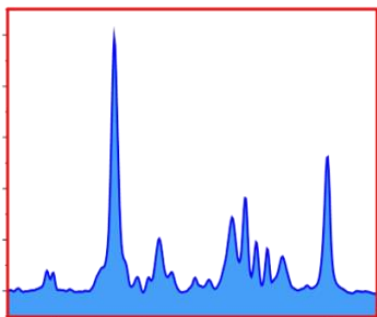
Ra=1.40



$10^{-14} \text{ M} = 2.8 \cdot 10^{-9} \text{ mg/L}$, EU 10^{-2} mg/L



- + Paraoxon
- + Sudan III
- + Fumonisin B1



Pacient I

Kazuistika pacientky po 4 roky

(nehojící se rána 22 let - infekce, otok, zápach, bolestivost)

Paní je polymorbidní

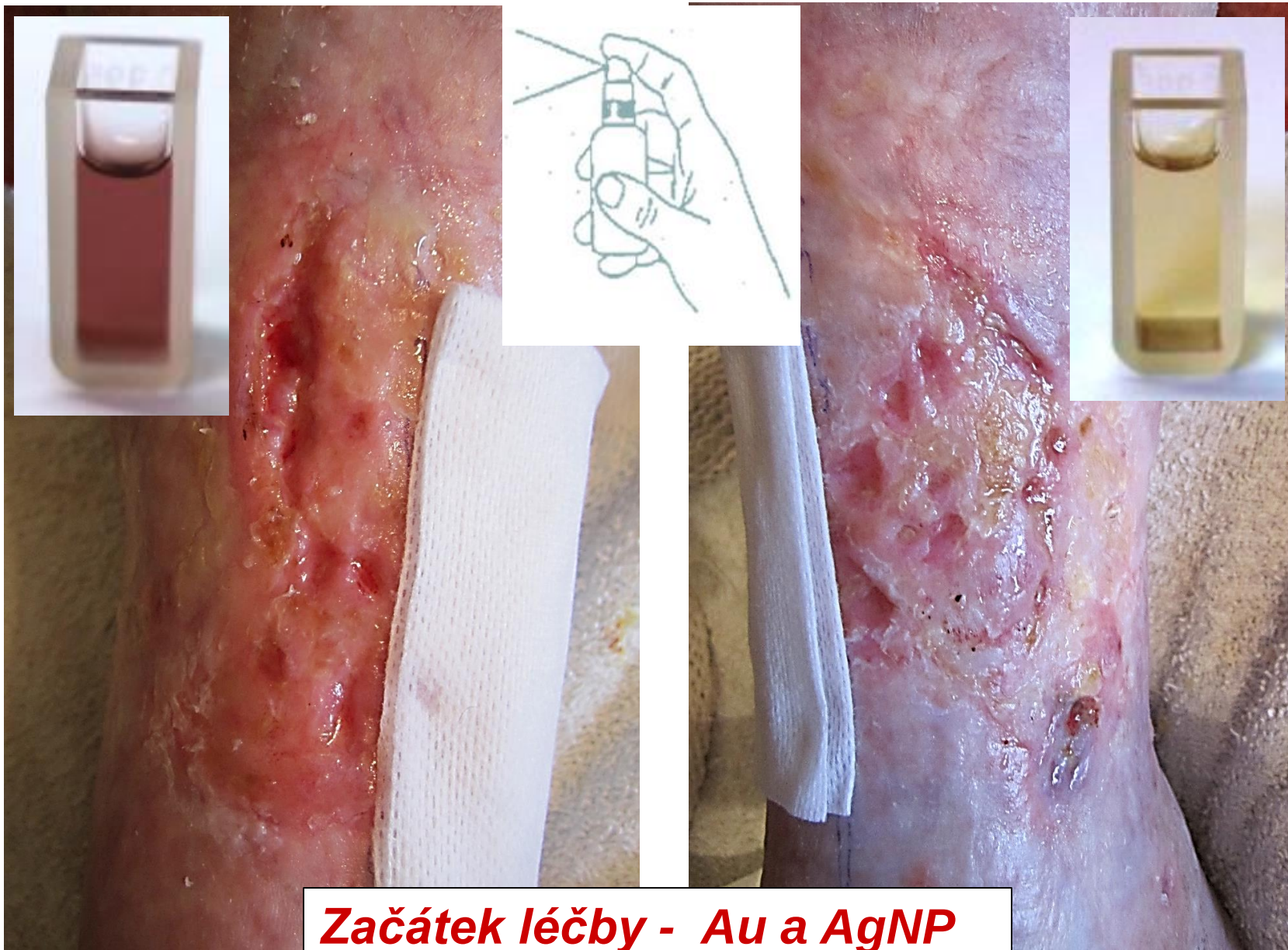
(prodělala trombózu, růži, embólii, má astma, léčí se se srdcem, je obézní)



Detail chronických ran

V.Švorčík, vaclav.svorcik@vscht.cz

22 let otevřená, infekce, otok, bolestivost, zapáchající rána, 5 let léčí



Začátek léčby - Au a AgNP

27.1.2016

AuNPs

V.Švorčík, vaclav.svorcik@vscht.cz

1.2.2016

5.2.2016



viditelné zlepšení

rány nejsou povleklé, některé se zmenšují, zacelují

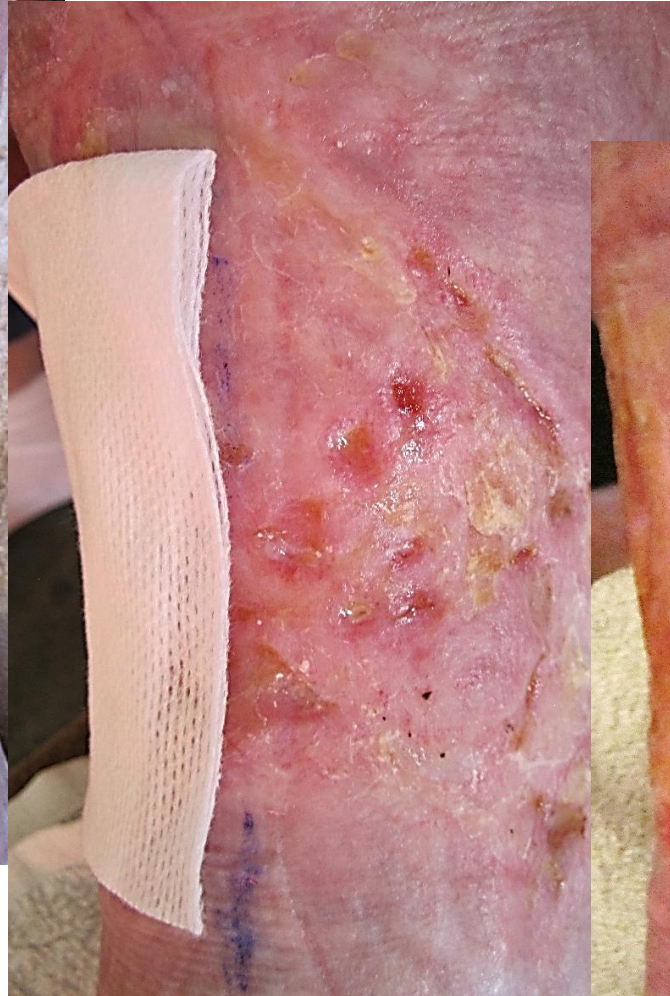
27.1.2016

AgNPs

V.Švorčík, vaclav.svorcik@vscht.cz

1.2.2016

5.2.2016



viditelné zlepšení

rány nejsou povleklé, některé se zmenšují, zacelují

Pacient II

V.Švorčík, vaclav.svorcik@vscht.cz

12.3.2016



30.3.2016

V.Švorčík, vaclav.svorcik@vscht.cz

Účinek roztoků je skvělý. Na ranách je krásně vidět, jak se čistí a hojí. Stříbro, ionty Ag^+ jsou agresivní vůči gramnegativním i grampozitivním bakteriím. Napadají buňku patogenů a její fyziologické funkce, buněčnou blánu, metabolické děje, nukleové kyseliny (DNA, RNA). Ionty přerušují nejdůležitější životně významné funkce v mikroorganismu a bez těchto funkcí je buďto růst bakterie potlačen a nebo častěji je mikroorganizmus usmrcen. Jinak některé rány se hojí mnoho let a **tento pán je šťastný, že tolik nezapáchá a sekrece není tak výrazná a dokonce se rány zmenšují a čistí. A to je krok k tomu, aby se zatáhly.**



27.1.2016

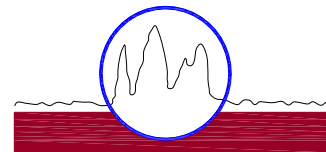


11.6.2016



18.7.2016





Děkuji Vám za pozornost