

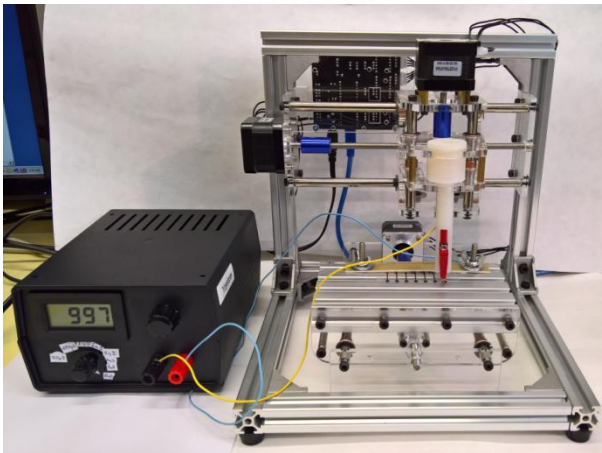
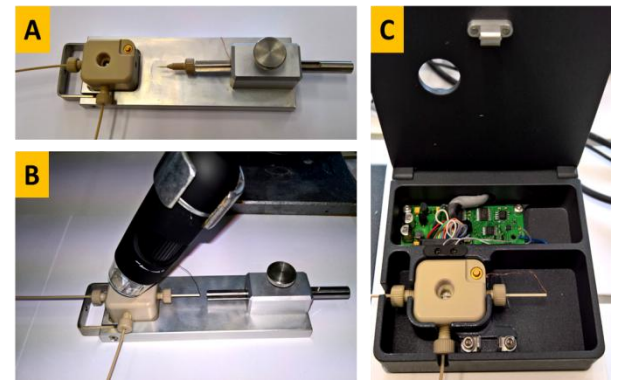
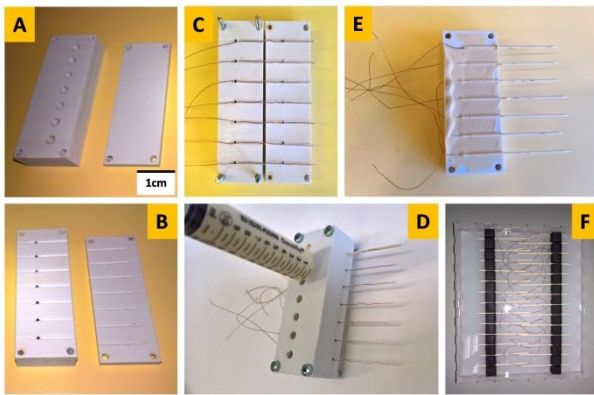
Výzkumná skupina elektrochemie

Výzkumné zaměření

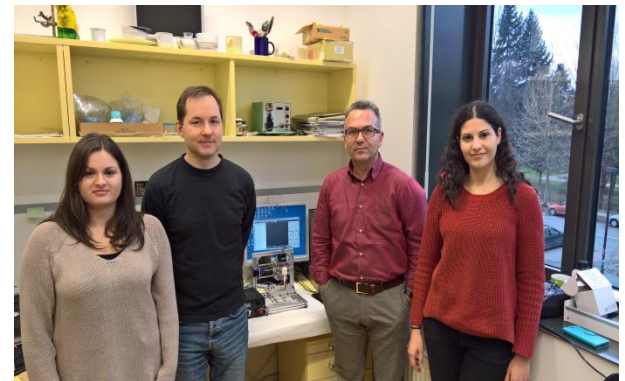
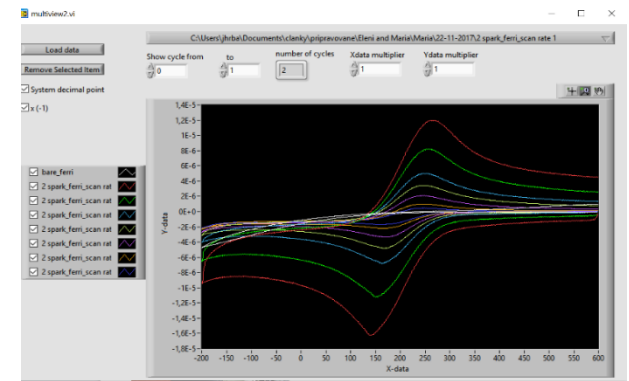
Zabýváme se vývojem elektrochemických senzorů a detektorů určených pro stanovení nízkomolekulárních látek s enviromentálním, farmaceutickým a biomedicínským významem.

Věnujeme se třem výzkumným oblastem:

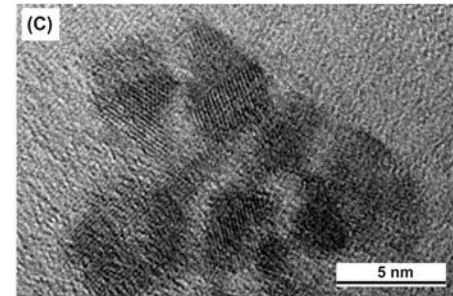
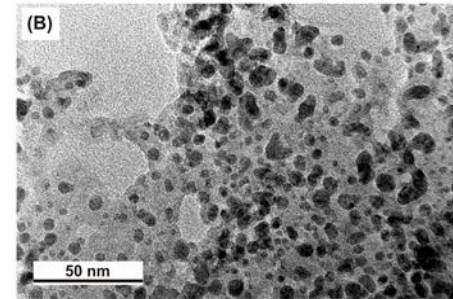
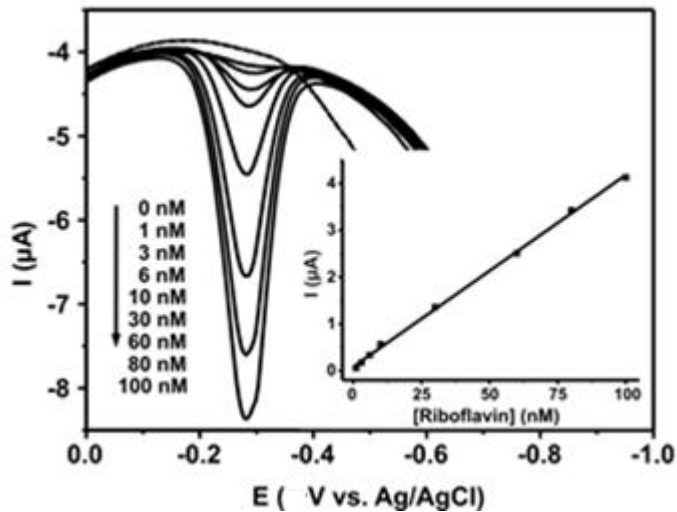
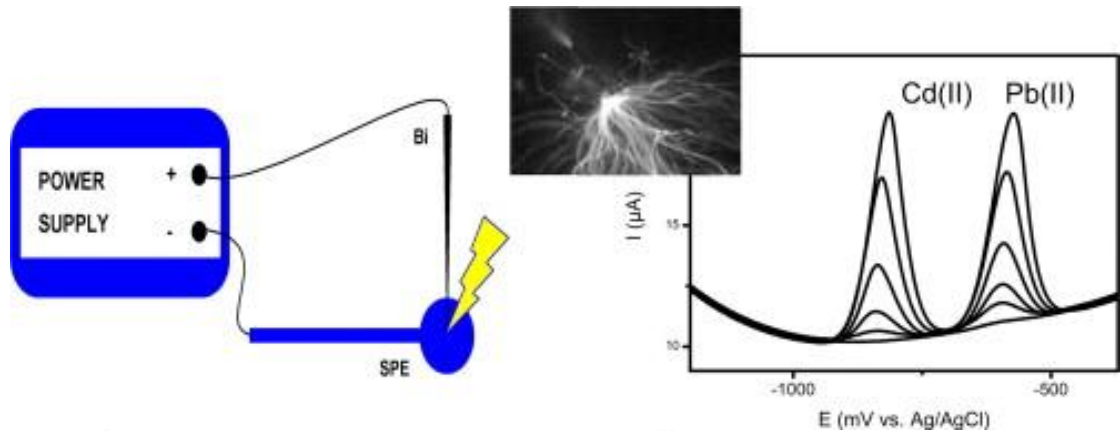
- designu a experimentálnímu ověřování vlastností funkčních vrstev, které poskytují elektrodovým povrchům citlivost (elektrokatalytické vrstvy) a selektivitu (permselektivní a iontoměničové vrstvy) vůči analyzovaným substancím, chirální vrstvy apod.
- návrhům a konstrukcím detektorů pro průtokovou injekční analýzu (FIA) a vysokoúčinnou kapalinovou chromatografii (HPLC).
- vývojem elektrochemických postupů pro tvorbu nanostrukturovaných kovových vrstev, které jsou aplikovatelné jako substráty pro povrchem zesílenou Ramanovu spektroskopii (SERS).



Konstrukce (3D tisk apod.)
Vývoj hardware
Software
Mezinárodní spolupráce



Funkční vrstvy pro elektrochemické senzory - zvýšení citlivosti pro určitý analyt nebo skupinu analytů (elektrokatalytické vrstvy)



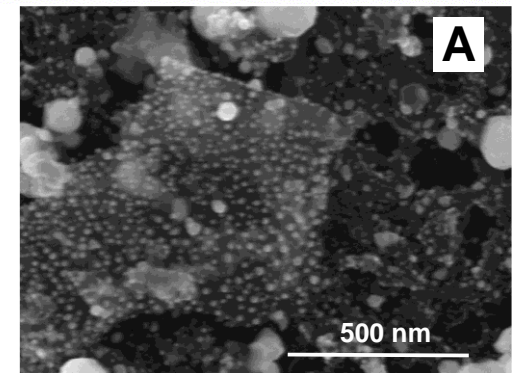
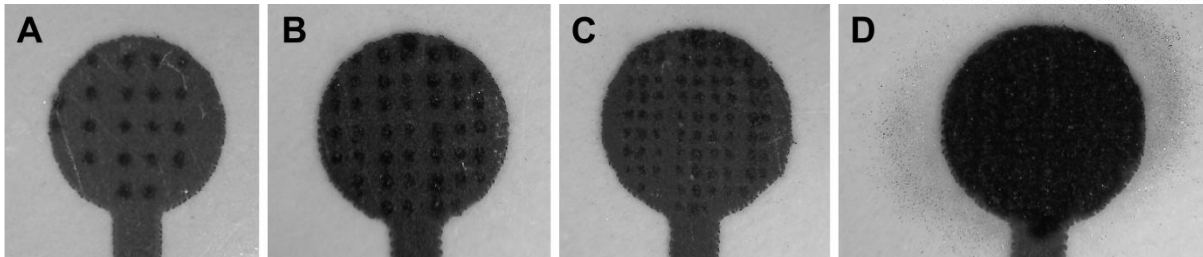
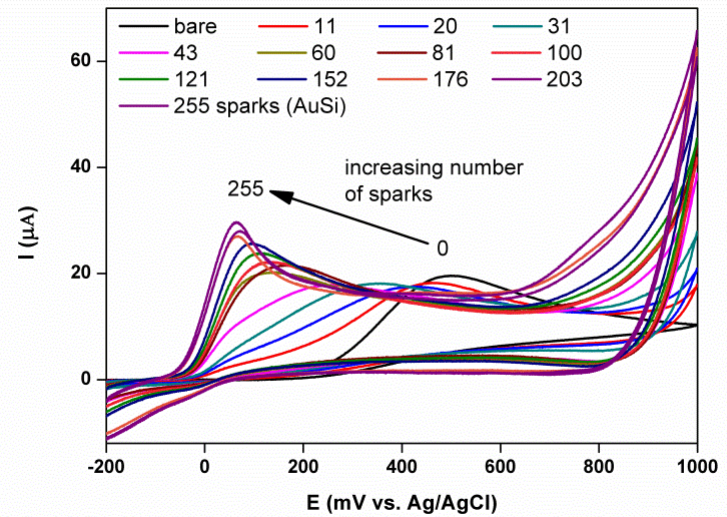
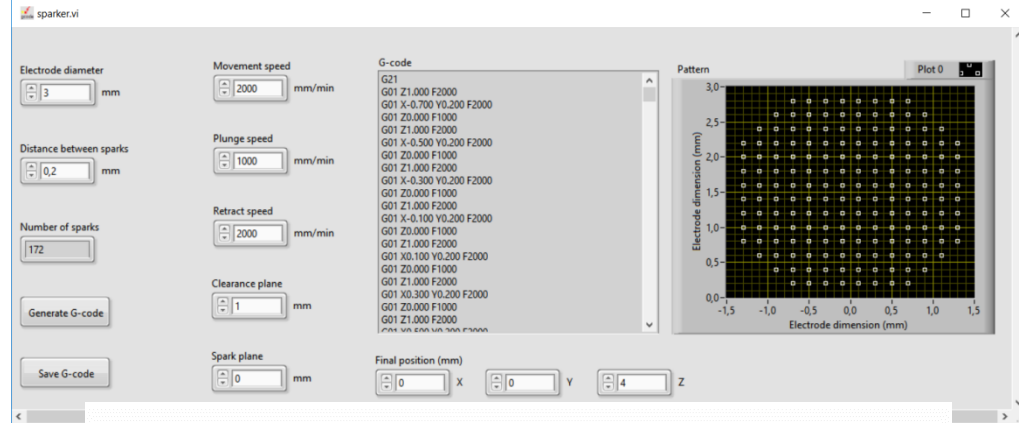
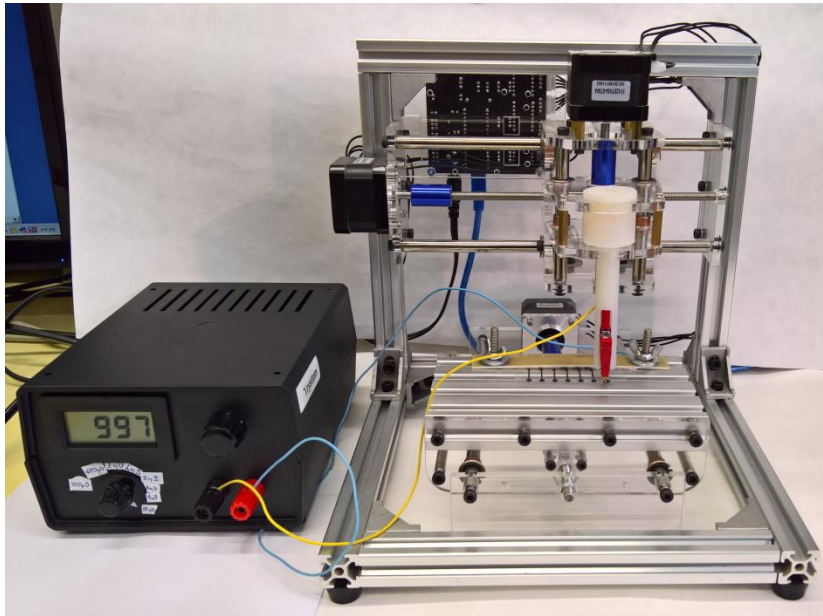
D. Riman, D. Jirovsky, J. Hrbac*, MI Prodromidis*, Green and facile electrode modification by spark discharge: Bismuth oxide-screen printed electrodes for the screening of ultra-trace Cd(II) and Pb(II). *Electrochem. Commun.* 50 (2015) 20-23.

D. Riman, A. Avgeropoulos, J. Hrbac*, MI Prodromidis*, Sparked-bismuth oxide screen-printed electrodes for the determination of riboflavin in the sub-nanomolar range in non-deoxygenated solutions. *Electrochim. Acta* 165 (2015) 410-415.

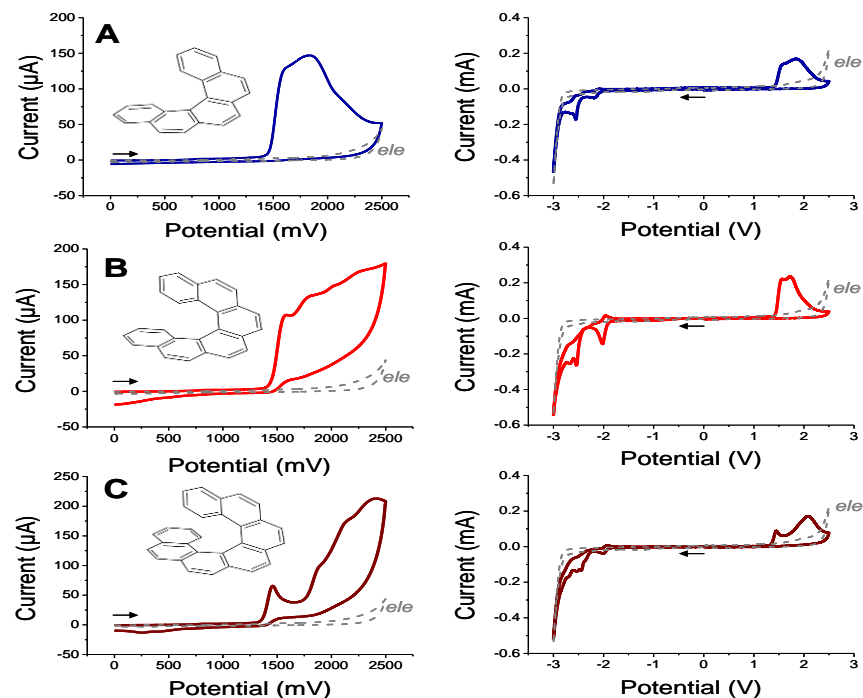
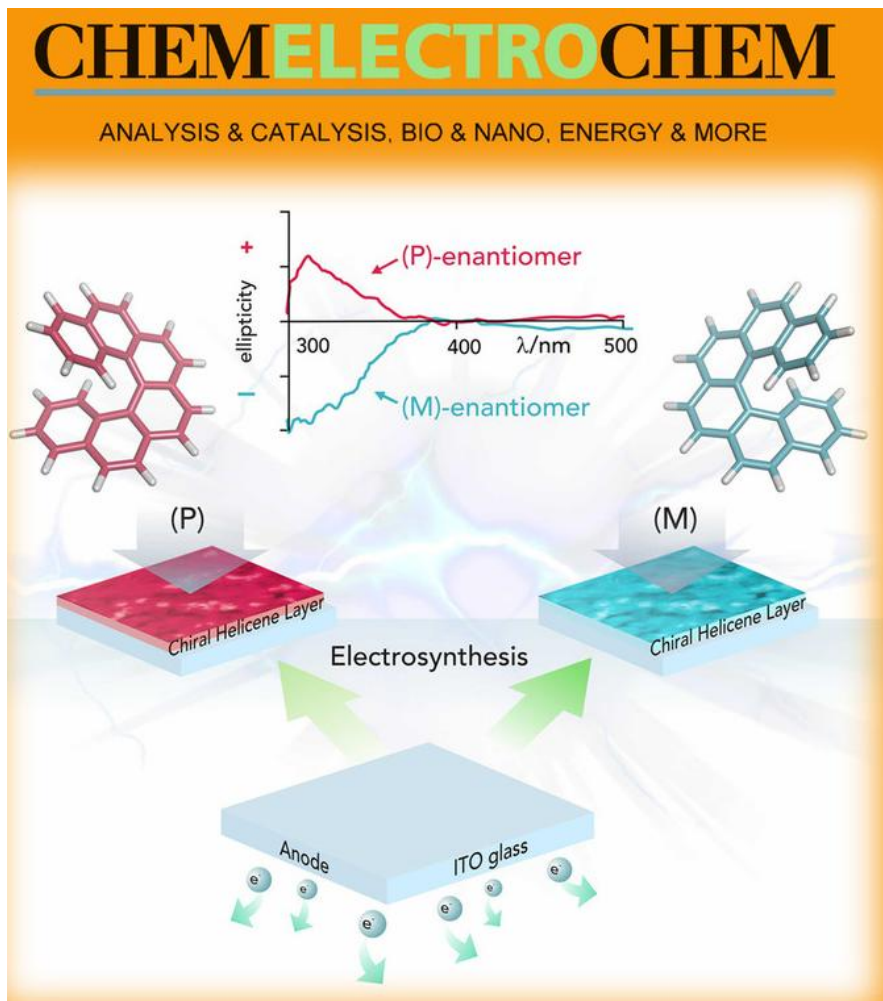
D. Riman, K. Spyrou, A.E. Karantzalis, J. Hrbac*, M.I. Prodromidis*, Glucose sensing on graphite screen-printed electrode modified by sparking of copper nickel alloys, *Talanta* 165 (2017) 466-473.

M.G. Trachioti, J. Hrbac, M.I. Prodromidis*, Determination of Cd and Zn with "green" screen-printed electrodes modified with instantly prepared sparked tin nanoparticles, *Sensors and Actuators B: Chemical*, 260 (2018) 1076-1083.

Automatizace



MG Trachioti, El Tzianni, D Riman, J Jurmanova, MI Prodrmidis, J Hrbac, Extended coverage of screen-printed graphite electrodes by spark discharge produced gold nanoparticles with a 3D positioning device. Assessment of sparking voltage-time characteristics to develop sensors with advanced electrocatalytic properties, *Electrochimica Acta* 304 (2019) 292-300,

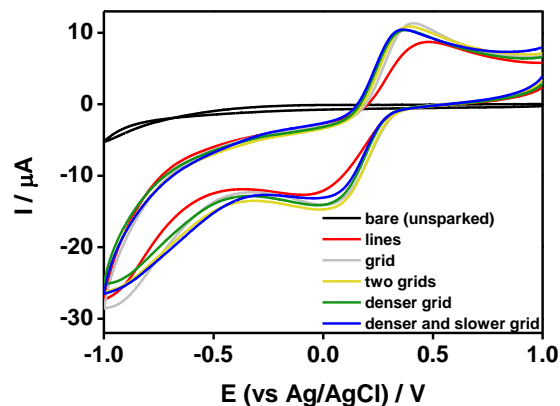
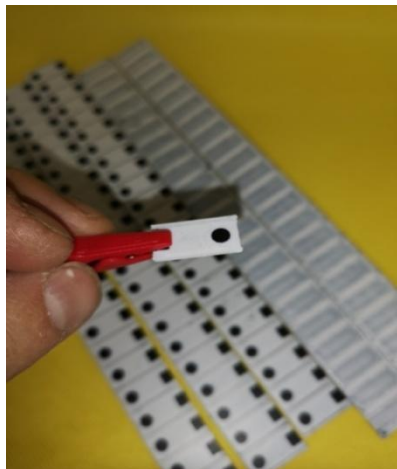


Hrbac, J., Strasak, T., Fekete, L., Ladanyi, V., Pokorny, J., Bulir, J., Krbal, M., Zadny, J., Storch, J., Vacek*, J. Potential-Driven On/Off Switch Strategy for the Electrosynthesis of [7]Helicene-Derived Polymers. *ChemElectroChem*, 4 (12) (2017) 3047-3052.

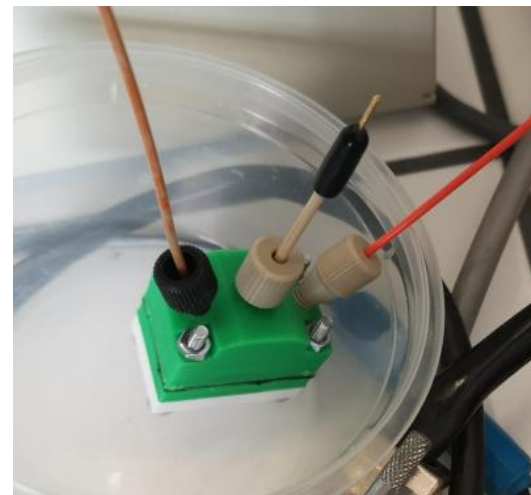
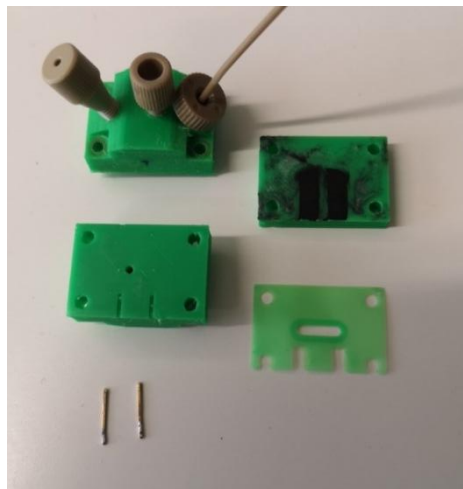
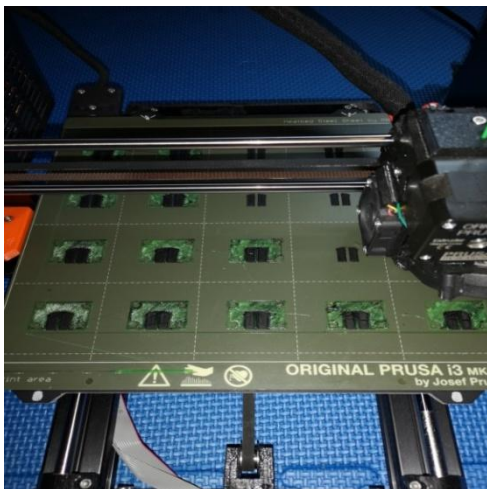
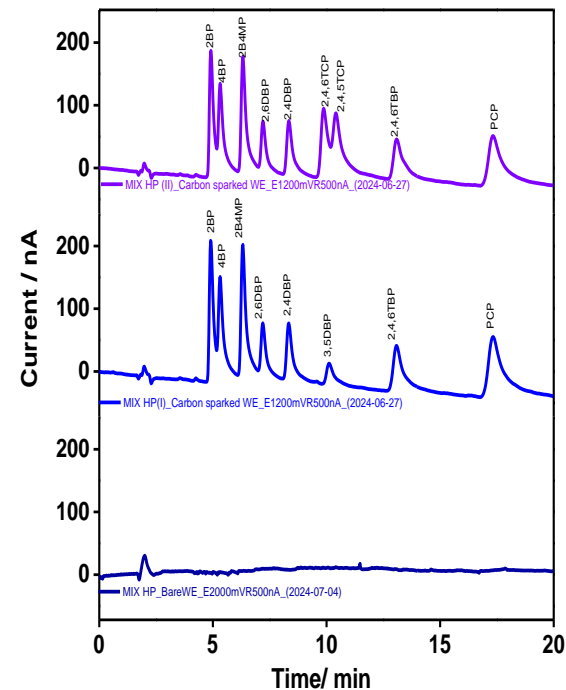
J. Vacek*, J. Hrbac*, T. Strasak, V. Cirkva, J. Sykora, L. Fekete, J. Pokorny, J. Bulir, M. Hromadova, J. Crassous and J. Storch*, Anodic Deposition of Enantiopure Hexahelicene Layers, *ChemElectroChem*, 5 (15) (2018) 2080-2088.

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Návrhy a konstrukce detektorů pro FIA a HPLC



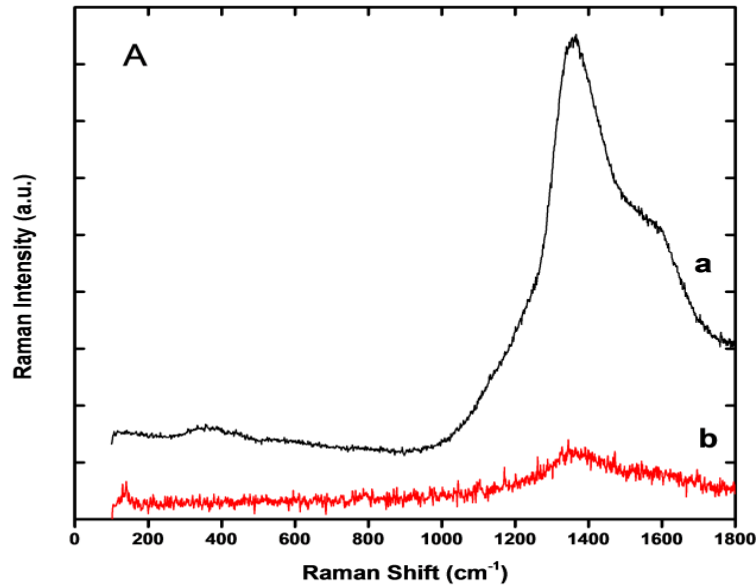
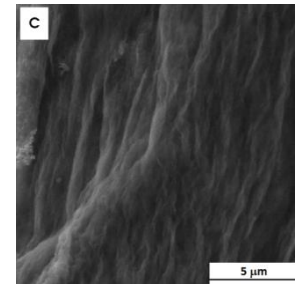
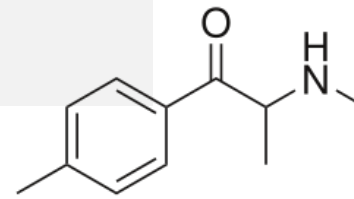
Využití 3D tisku v elektrochemii



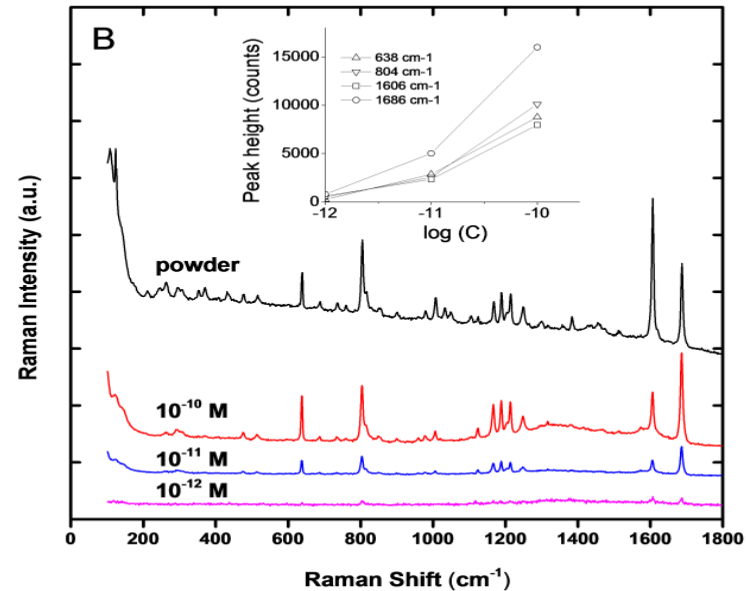
J.F. Hernández-Rodríguez, M.G. Trachioti, J. Hrbac, D. Rojas, A. Escarpa, M.I. Prodromidis, Spark-Discharge Activated 3D-Printed Electrochemical Sensors, *Anal. Chem.* 2024, 96, 25, 10127-10133

M. Mertiri, J. Hrbac, M. Prodromidis, A. Economou, C. Kokkinos, Digital fabrication of 3D printed bismuth sparked sensors for electrochemical sensing, *Appl Mater Today*, 39 (2024).

Elektrodepozice nanomateriálů pro neelektrochemické aplikace – Stanovení drog na elektrodě z uhlíkového vlákna pokrytého měděnými nanodráty



(a) pristine (b) copper coated CF (x10 on y-scale)



4-mephedrone by evaporating 5 μL of solution on the Cu-coated CF



V. Halouzka, B. Halouzкова, D. Jirovsky, D. Hemzal, P. Ondra, E. Siranidi, A.G. Kontos, P. Falaras, J. Hrbac*, Copper nanowire coated carbon fibers as efficient substrates for detecting designer drugs using SERS, *Talanta*, 165 (2017) 384-390.

Pavelka, V Hemzal, D Hrbac, J, Complex evaluation of Raman spectra using morphological filtering: Algorithms, software implementation, and experimental verification of baseline correction, peak recognition, and cosmic ray removal in SERS spectra of designer drugs, *J Raman Spectrosc*, 53(12) (2022) 2100.

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