

# MICHAEL KROKER



## Profile

**Ph.D. in Physics (expertise in material science and plasma physics)**

**Creative, problem-solving researcher with technical skills**

**5+ years of experimental work, material analysis and thin film development**

**Ability to communicate with industrial partners and other associates**

## Education

- 2018 – 2023 **Ph.D. in Plasma Physics, Masaryk University, Brno**  
Thesis: *Magnetron sputtered hard ternary coatings with enhanced fracture toughness*
- 2016 – 2018 **Mgr. in Plasma Physics, Masaryk University, Brno**  
Thesis: *Deposition and characterization of nanolaminates*
- 2013 – 2016 **Bc. in Nanotechnology, Masaryk University, Brno**  
Thesis: *Development of industrial technology for deposition of DLC thin films*

## Work experience



- 2019 – 2022 **Researcher, Masaryk University, Brno**  
Managing industrial research collaboration with SHM, s.r.o.  
Analysis and development of sputtered thin films.  
Developing of industrial process to deposit nanolaminate ternary metal-boron-carbon coatings.  
Designing sputter systems (hardware & software)
- 2016 (Feb, Jul) **Research internship, SHM, s.r.o., Šumperk**  
Diamond-like carbon coatings development prepared by hybrid PVD-PECVD deposition process.
- 2015 – 2019 **Part-time cooperation, Masaryk University, Brno**  
Member of a research group that focuses on magnetron sputtering. Specialization in thin film deposition, analysis of thin films and simulation of the sputtering process.
- 2013 – 2022 **Network manager, IT support, ETOURS, Uherské Hradiště**  
Management of computer network and technical support

## Skills

Experimental data processing, analysis, and results reporting  
Confident in the use of graphing software like OriginLab Pro as well as open-source QtiPlot, Plotly and Python graphing libraries  
Highly skilled in SEM imaging and standard-based EDX chemical analysis  
Material characterization (HR-TEM, x-ray analysis, electron diffraction, confocal microscopy, 3D profilometry, mechanical testing)  
Software development and data processing using Python and MATLAB  
Simulation of sputtering process (SDTrimSP) and particle transport (SiMTra)  
Experienced in IT support and company network deployment  
MS Office (Word, Excel, PowerPoint, Access), LATEX, Web Design

Autumn School of Electron Microscopy 2022 (ISI, Czech Academy of Sciences)  
7 peer-reviewed scientific articles, 12 conference contributions, 2 awards

## Contact

-  on request
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-  [www.kroker.cz](http://www.kroker.cz)
-  [in/michaelkroker/](https://in/michaelkroker/)

## Highlighted skills

- ✓ Experimental data processing & analysis
- ✓ Industry collaboration
- ✓ Results reporting
- ✓ SEM imaging
- ✓ Python programming

## Technical skills

- ✓ High-vacuum systems
- ✓ SEM / EDX
- ✓ X-ray diffraction
- ✓ Raman spectroscopy
- ✓ 3D profilometry
- ✓ Confocal microscopy
- ✓ TEM / SAED data processing

## Hobbies

- Electronics
- Cycling
- Running
- Hiking

# Research & Development projects

## **Advance characterization and modeling of the sputtering process of the W-B-C hard protective coatings**

*January 2022 – December 2022 (Grant Agency of Masaryk University)*

- Managed the project and related activities.
- Developed methodology for standardization of energy dispersive x-ray spectroscopy (EDX).
- Implemented an approach for predicting chemical composition and relative thickness of coatings prepared by magnetron sputtering.
- Developed methodology for evaluating damage resistance of coatings using instrumental indentation.

## **Modernization of Alcatel SCM 650 sputtering system**

*February 2020 – August 2021 (PVD Laboratory internal group project)*

- Designed full upgrade of the system (high-vacuum, gas distribution, motions, cooling, sensors, safety power).
- Overhauled high-vacuum system.
- Implemented PLC control of the sputtering system including precautions for safe operations.
- Designed firmware and software procedures for computer control of the system.

## **Magnetron sputtered nanolaminated coatings - prospective hard material with enhanced fracture toughness**

*January 2019 – June 2022 (Grant Agency of Czech Republic)*

- Described structural and mechanical properties of tantalum- and tungsten-based coatings.
- Developed methods for coating characterization, which were further utilized by other co-investigators
- Consulted research findings of other investigators.

## **Development of industrial technology for deposition of hard XBC and TiXN coatings with enhanced fracture toughness**

*January 2018 – December 2021 (TRIO program of Czech Ministry of Industry and Trade)*

- Managed and organized research tasks to fulfill the goals of the project.
- Collaborated with coating manufacturer on deployment and application testing.
- Developed industrial process for W-B-C and Ta-B-C hard protective coatings deposition.
- Studied aspects of the industrial deposition process.
- Designed sputtering targets for production manufacturing using own process simulation tool.

## **Synthesis and characterization of thin films with nanolaminate microstructure**

*February 2017 – January 2018 (Rector's program for outstanding diploma theses at Masaryk University)*

- Investigated feasibility of the coating's deposition from segmented cylindrical target
- Developed methodologies for compositional, structural, and mechanical characterization of the metal-boron-carbide coatings

## **Industrially deposited hard and damage resistant W-B-C coatings**

KROKER, Michael, Pavel SOUČEK, Lukáš ZÁBRANSKÝ, Vilma BURŠÍKOVÁ, Zsolt CZIGÁNY, Vjačeslav SOCHORA, Katalin BALÁZSI, Mojmír JÍLEK & Petr VAŠINA  
Surface & Coatings Technology (2023), after minor revision (November 2022)

## **Modelling of dcMS and HiPIMS process with hydrocarbon gas admixture**

FEKETE, Matej, Michael KROKER, Pavel SOUČEK, Peter KLEIN & Petr VAŠINA  
Plasma Sources Science and Technology **31** (2022), 065008

## **Spatially resolved study of spokes in reactive HiPIMS**

ŠLAPANSKÁ, Marta, Michael KROKER, Peter KLEIN, Jaroslav HNILICA & Petr VAŠINA  
Plasma Sources Science and Technology **31** (2022), 055010

## **Predicting the composition of W-B-C coatings sputtered from industrial cylindrical segmented target**

KROKER, Michael, Pavel SOUČEK, Marta ŠLAPANSKÁ, Vjačeslav SOCHORA, Mojmír JÍLEK & Petr VAŠINA  
Surface and Coatings Technology **438** (2022), 128411

## **Single-shot spatial-resolved optical emission spectroscopy of argon and titanium species within the spoke**

ŠLAPANSKÁ, Marta, Michael KROKER, Jaroslav HNILICA, Peter KLEIN & Petr VAŠINA  
Journal of Physics D: Applied Physics **55** (2022), 035205

## **Composition, structure and mechanical properties of industrially sputtered Ta–B–C coatings**

KROKER, Michael, Pavel SOUČEK, Pavol MATEJ, Lukáš ZÁBRANSKÝ, Zsolt CZIGÁNY, Katalin BALÁZSI & Petr VAŠINA  
Coatings **10(9)** (2020), 853

## **On the origin of multilayered structure of W-B-C coatings prepared by non-reactive magnetron sputtering from a single segmented target**

KROKER, Michael, Zsolt CZIGÁNY, Zdeněk WEISS, Matej FEKETE, Pavel SOUČEK, Katalin BALÁZSI, Vjačeslav SOCHORA, Mojmír JÍLEK & Petr VAŠINA  
Surface and Coatings Technology **377** (2019), 124864

# Conference contributions

## [Industrial Deposition of W-B-C Coatings: Properties and Process Modelling](#)

[KROKER, Michael](#), Pavel SOUČEK, Lukáš ZÁBRANSKÝ, Vilma BURŠÍKOVÁ, Sochora VJAČESLAV, Mojmír JÍLEK & Petr VAŠINA.  
48th International Conference on Metallurgical Coatings and Thin Films (2022)

## [Investigation of spokes in reactive Ar/N<sub>2</sub> atmosphere using HiPIMS](#)

KLEIN, Peter, Jaroslav HNILICA, Marta ŠLAPANSKÁ, [Michael KROKER](#) & Petr VAŠINA  
25th Europhysics Conference on Atomic and Molecular Physics of Ionized Gases (2022)

## [Mapping the X-B-C Systems: Search for the Elusive X<sub>2</sub>BC Phase](#)

SOUČEK, Pavel, Stanislava DEBNÁROVÁ, Mostafa ALISHAHI, Saeed MIRZAEI, [Michael KROKER](#), Lukáš ZÁBRANSKÝ, Vilma BURŠÍKOVÁ, Zsolt CZIGÁNY, Katalin BALÁZSI, Marcus HANS, Damian HOLZAPFEL, Stanislav MRÁZ, Jochen Michael SCHNEIDER & Petr VAŠINA  
48th International Conference on Metallurgical Coatings and Thin Films (2022)

## [Rotating spokes in reactive HiPIMS process measured by spatially resolved OES](#)

ŠLAPANSKÁ, Marta, [Michael KROKER](#), Jaroslav HNILICA, Peter KLEIN & Petr VAŠINA  
48th International Conference on Metallurgical Coatings and Thin Films (2022)

## [Single-Shot Spatially Resolved Optical Emission Spectroscopy of Plasma Species within the Spoke](#)

ŠLAPANSKÁ, Marta, [Michael KROKER](#), Jaroslav HNILICA, Peter KLEIN & Petr VAŠINA  
Plasma Processing and Technology International Conference 2021 (2021)

## [The Industrially Deposited W-B-C Coatings from Segmented Target](#)

[KROKER, Michael](#), Pavol MATEJ, Pavel SOUČEK, Lukáš ZÁBRANSKÝ, Vilma BURŠÍKOVÁ, Sochora VJAČESLAV, Mojmír JÍLEK & Petr VAŠINA  
International Conference on Metallurgical Coatings and Thin Films (2021)

## [The single-shot spatial-resolved OES of the spoke in non-reactive HiPIMS](#)

ŠLAPANSKÁ, Marta, [Michael KROKER](#), Jaroslav HNILICA, Peter KLEIN & Petr VAŠINA  
47th International Conference on Metallurgical Coatings and Thin Films (2021)

## [Hard and fracture resistant metal-boron-carbon based coatings deposited by industrial sputtering system](#)

VAŠINA, Petr, [Michael KROKER](#), Pavol MATEJ, Matej FEKETE, Lukáš ZÁBRANSKÝ, Pavel SOUČEK, Saeed MIRZAEI, Mostafa ALISHAHI, Vilma BURŠÍKOVÁ a Vjačeslav SOCHORA  
Platinum (2019)

## [On the origin of multilayered structure of W B C coatings prepared by non-reactive magnetron sputtering from a single segmented target](#)

[KROKER, Michael](#), Pavel SOUČEK, Matej FEKETE, Petr ZIKÁN, Adam OBRUSNÍK, Zsolt CZIGÁNY, Katalin BALÁZSI, Zdeněk WEISS & Petr VAŠINA.  
46th International Conference on Metallurgical Coatings and Thin Films (2019)

## [Influence of chemical composition on structure and mechanical properties of W-B-C coating deposited in industrial sputtering system](#)

VAŠINA, Petr, [Michael KROKER](#), Matej FEKETE, Lukáš ZÁBRANSKÝ a Vilma BURŠÍKOVÁ.  
83rd IUVESTA Workshop (2018)

## [Feasibility study of WBC synthesis from segmented magnetron target](#)

[KROKER, Michael](#), Pavel SOUČEK & Petr VAŠINA.  
8th International Conference on Innovations in Thin Film Processing and Characterization (2017)

## [Properties of WBC coatings prepared by magnetron sputtering from industrial segmented target](#)

[KROKER, Michael](#), Pavel SOUČEK, Lukáš ZÁBRANSKÝ, Vilma BURŠÍKOVÁ & Petr VAŠINA  
16th International Conference on Reactive Sputter Deposition (2017)