

Laboratory of PVD technologies

(preparation of hard coatings for engineering applications by PVD methods)
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The laboratory is equipped with the latest iPVD technologies for the preparation of hard, suprhhard and functional coatings based on single- and multicomponent systems, including nanocomposite, multilayer and gradient coatings for engineering and other purposes using High Power Impulse Magnetron Sputtering (HiPIMS) and High Target Utilization Sputtering (HiTUS).



1. **Cryofox Discovery 500**, upgraded PVD apparatus with HiPIMS a DCMS power sources (Polyteknik, Denmark)

- 3 ubalanced magnetrons (2 focused) with DC and HiPIMS power sources
- rotating sample holder with the substrate heating up to 500°C and pulsed bias up to -1400 V
- Reactive sputtering (N₂, C₂H₂, H₂, O₂)

Benefits: hardness increase in W-C coatings from 15-17 GPa up to 28.4 ± 3.4 GPa **(+65%)**

2. **PQL S500**, HiTUS technology of sputtering of thin films and coatings (PQL Ltd., United Kingdom)

- 4 targets with 100 mm diameter and RF power source for electrically conductive and insulating materials
- Rotating sample holder with the substrate heating držiak up to 500°C and RF bias up to 500 W
- Reactive sputtering (N₂, C₂H₂, H₂, O₂)
- *in situ* measurements of substrate temperature, deposition rate and residual gas composition and plasma composition (using optical spectroscopy).

Prínos: hardness increase of W-C coatings up to 34.0 ± 3.0 GPa **(+100%)**



Both PVD technologies exhibit extremely high level of ionization of target material which results in better control of the coating properties, especially density and hardness, wear resistance and adhesion. HiTUS principally enables coating deposition on plastic foils and also hard coatings on bearing steel at temperatures < 200°C