

Carbon-based nanocomposites, prepared by magnetron sputtering and HiPIMS

Sven Ulrich¹, Christian Poltorak¹, Andreas Bergmaier², Klaus Seemann¹, Michael Stüber¹, Michael Thomas Dürschnabel¹, Hadwig Sternschulte³, Jakob Grau³, Jaakko Julin⁴, Timo Sajavaara⁴, Sven Ulrich¹

¹⁾ *Karlsruhe Institute of Technology (KIT), Institute for Applied Materials (IAM-AWP), Karlsruhe, Germany,*

²⁾ *University of the Bundeswehr Munich, Institute for Applied Physics and Measurement Technology (LRT2), Neubiberg, Germany*

³⁾ *Technical University of Applied Sciences Augsburg, Augsburg, Germany*

⁴⁾ *RADIATE, University of Jyväskylä, Department of Physics, Jyväskylä, Finland*

Depending on the hydrogen and carbon content and the selected process conditions, both hydrogenated, nano-crystalline, single-phase, hard transition metal carbide coatings ($T_{Me}C_{1-x}:H$) and hydrogenated, low-friction, carbon-based transition metal carbide $T_{Me}C_{1-x}:H/a-C:H$ nanocomposites, which are particularly suitable as tribological protective layers, can be produced by magnetron sputtering as well as HiPIMS. The synthesis was carried out using reactive magnetron sputtering and HiPIMS with a transition metal target, e.g. Ti, in an argon/methane atmosphere and at low and elevated substrate temperatures of 200°C and 400°C. By combining several analytical methods, namely SEM, XRD, XRR, EPMA, ERD, Raman spectroscopy, TEM and HRTEM, the microstructure could be determined and a correlation with the mechanical properties could be worked out and explained with a simple model.

13th Vacuum Technology Conference

(XIII Konferencja Techniki Próźni)

Institute of Physics of the Polish Academy of Sciences, Warsaw,

19th-20th September 2024