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A Decade of RF-ICP Plasma Spraying at IPP Prague: From System Modifications to Advanced Applications

Abstract:

The RF-ICP system was acquired by the Institute of Plasma Physics in Prague in 2016 and became fully operational in 2017, providing a versatile platform for thermal spray processing of advanced materials. This contribution presents an overview of the first decade of its operation, highlighting key technical developments and selected application-oriented results.

The first part of the talk focuses on modifications to the original system design that significantly expanded its capabilities. These include implementation of a water-cooled substrate holder to enable spraying onto metallic substrates, as well as integrating of the DPV-2000 diagnostic system for in-flight particle temperature and velocity measurements.

The second part presents a selection of representative results that illustrate the range of materials and processes investigated. These span from coating experiments, through powder processing using the spheroidization reactor introduced in recent years, to the latest developments in reactive plasma spraying. Emphasis will be placed on demonstrating the versatility of the RF-ICP technology and its applicability across different material systems and processing approaches.

Biography:

Jakub Klečka, Ph.D., is a researcher at the Institute of Plasma Physics of the Czech Academy of Sciences in Prague, where he has been working since 2015. He has been involved with RF-ICP plasma technology at IPP from its early implementation, initially as a technician and later as a Ph.D. student, completing his doctoral degree in June 2024. He currently holds a postdoctoral position. His research focuses on plasma-assisted materials processing using RF-ICP technologies, with emphasis on thermal spray coating deposition and powder treatment. His work includes the development of functional metallic coatings for fusion-relevant applications, particularly for plasma-facing components, as well as powder spheroidization and, more recently, reactive plasma spraying.