

# Fabrication and Characterization of Magnetron Sputtered Tungsten/EUROFER 97 Coatings

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## Abstract

A specific topic of R&D on components of the helium cooled divertor developed at the Karlsruhe Institute of Technology addresses the thermal mismatch between the ferritic martensitic steel EUROFER97 and tungsten. Previous FE-simulations showed that a functionally graded joint between these two materials should result in a reduction of the thermally induced stresses and strains.

In this work materials science based aspects of the development of new functionally graded tungsten/EUROFER97 joining layers will be presented and critically discussed. W-Fe-Cr-Mn-C coatings were deposited by magnetron sputtering of a segmented tungsten/EUROFER97 target. The substrate samples were placed in various, stationary positions opposite to this target. For each substrate position, a W-Fe-Cr-Mn-C coating with individual elemental composition, microstructure and properties were deposited. These coatings were characterized before and after heat treatment at 700°C by XRD methods to determine their crystal structure and a possible appearance of intermetallic phases. Porosity and morphology of the coatings were analysed by scanning electron microscopy. Additionally, nano-indentation tests were performed providing preliminary knowledge about the mechanical behaviour of the deposited layers.

*Keywords: divertor, functional graded materials (FGM), tungsten, EUROFER97, magnetron sputtering*

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