Jožef Stefan Institute
Ljubljana, Slovenia | K7 / Department for
Nanostructured Materials

SEMINAR II

Monday, 18.09.2023, 12.30, Kolar lecture hall

Development of functionally graded W-Cu composite

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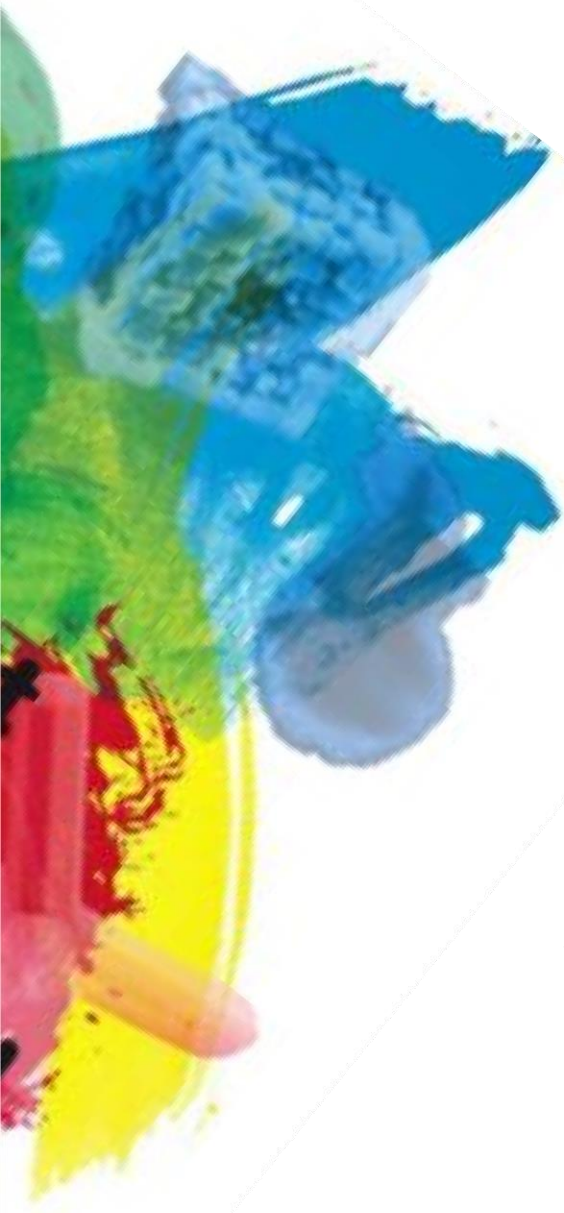

The efficiency of future fusion reactors depends, among other aspects, on the properties of the materials and their long-term stability. Tungsten (W) is the material of choice for plasma facing due to its properties such as high melting point, erosion resistance and low tritium accumulation. The high expected thermal loads place significant stress on the surface and interface between the tungsten monoblock and the heat sink.

To reduce the thermal stresses at the interface, a composite consisting of tungsten and copper (Cu) has been proposed to improve heat transfer. The composite is categorized as a pseudo-alloy due to a significant difference in melting temperatures. Thus, the high bonding strength of the metallurgical interface between W and Cu is difficult to realize, which presents an obstacle to its production. Therefore, to create W/Cu composite material, it was suggested to combine additive manufacturing and liquid infiltration methods. The possibilities of designing with improved properties and subsequent printing of diverse tungsten template structures are demonstrated in this work. A series of experiments were made to find the best conditions for copper infiltration of additively manufactured tungsten templates. The results demonstrate the potential of creating W/Cu composite materials by using such an approach, while further study is required to determine their thermomechanical properties.

Kindly invited.