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The impact of weak interfacial bonding strength on mechanical properties of metal matrix - ceramic reinforced composites.

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Abstract

In this work the influence of weak interface between particles and matrix on mechanical properties of metal matrix – ceramic reinforced composites is studied. Firstly, the samples made of coelectrodeposited Ni-SiC composites with 10% of SiC with poor interface bonding have been prepared. Furthermore, the tensile tests of samples have been performed. The determined Young's modulus was equal to 67 ± 8 GPa and the ultimate tensile strength to 230 ± 15 MPa. It is assumed that the very weak interface is the reason for the poor mechanical properties of the created material. In order to confirm the assumption and get the necessary parameters for the numerical model, the measurements of the normal and shear interfacial bonding strength of the interface have been performed. The measured normal interfacial bonding strength is equal to 0.1 ± 0.03 MPa and the interfacial shear strength is equal to 4.9 ± 0.2 MPa. The experimental results have been confirmed qualitatively by the computer simulations. Representative Volume Element has been created and modelled by the Finite Element Method with cohesive zone elements. The computer simulations result in the Young's modulus values from 119 GPa up to 126 GPa.

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