

Measurement of adhesion between ceramics and copper in sintered Cu-SiC composites.

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Cu-SiC composites are very promising materials which have high thermal and electrical conductivity and may find many applications. Unfortunately, the main disadvantage of these materials is the dissolution of silicon in copper at elevated temperature, which significantly reduces their properties. In order to overcome this problem particles can be coated with a protective material before sintering. In this paper the influence of three different metallic coatings on bonding strength were investigated. SiC particles were coated with tungsten, chromium or titanium. As reference a material with uncoated particles was prepared. The experiments were carried out with the use of microtensile tester (Fig. 1). The results show that the strongest interface can be produced when chromium coating is applied. In this case the bonding strength is approximately 50% stronger than in the case of uncoated particles. Unfortunately, the porosity of copper which was observed in the vicinity of chromium coating may significantly reduce other parameters such as thermal conductivity of the composite. On the other hand, tungsten coating increases the bonding strength about 30% and it is smooth and regular. This coating seems to be the best choice for applications in which not only mechanical properties of the composites are important. Furthermore, scanning electron and optical microscopes were used to determine the mechanism of debonding.

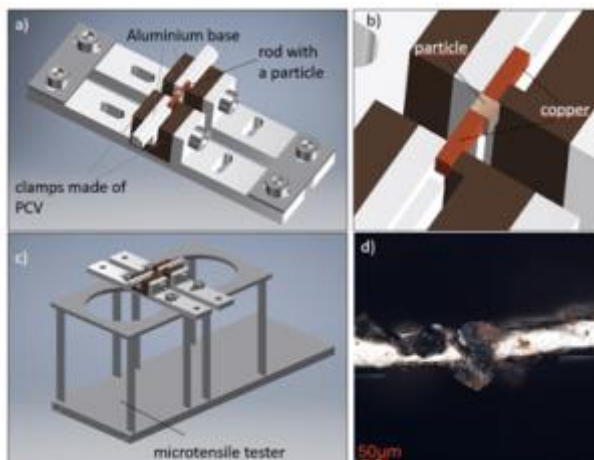


Figure 1. Microtensile tester scheme.