The measurement of the adhesion force between ceramic particles and metal matrix in ceramic reinforced-metal matrix composites

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The measurement of the adhesion force between ceramic particles and metal matrix in ceramic reinforced-metal matrix composites.

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Abstract
This paper presents the method for measurement of the adhesion force and fracture strength of the interface between ceramic particles and metal matrix in ceramic reinforced-metal matrix composites. Three samples with the following Cu to Al2O3 ratio (in vol.%) were prepared: 96.0Cu/2.0Al2O3, 95.0Cu/5.0Al2O3, and 90Cu/10Al2O3. Furthermore, microwires which contain a few ceramic particles were produced by means of electro etching. The microwires with clearly exposed interface were tested with use of the micrometers tester. The microwires usually break exactly at the interface between the metal matrix and ceramic particle. The force and the interface area were carefully measured and then the fracture strength of the interface was determined. The strength of the interface between ceramic particle and metal matrix was equal to 59±6 MPa and 58±7 MPa in the case of 2% and 5% Al2O3 to Cu ratio, respectively. On the other hand, it was significantly lower (37±4 MPa) for the wires made of composite with 10% Al2O3.

Conclusion
- Microtensile tester allows the interface strength determination
- The force can be measured down to 0.1mN
- Due to the SEM investigation of tensiled wires it is possible to determine the contact area with 15% measurement error
- The technique allows investigation of the influence of different parameters of production process on the interface strength

References