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Characterisation of powder metallurgy Cu-ZrO_2 composites

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ABSTRACT

Cu-ZrO_2 composites can be used as electrical contact materials in relays, contactors, switches, circuit breakers, electronic packaging requiring good electrical and thermal conductivity as well as welding or brazing properties. In the presented work copper matrix composites reinforced with 8 mol % yttria-stabilised 1 wt. %, 2 wt. %, 3 wt. %, 4 wt. %, and 5 wt. % zirconia (8-YSZ) particles were fabricated by the powder metallurgy method. Cu and Cu-ZrO_2 powder mixtures were compacted with a compressive force of 500 MPa and sintered at 900 °C for 2 h within an argon atmosphere. The results of the study on the mechanical properties of the composites showed that with increasing content of ZrO_2, the micro-hardness and compressive strength increase. The relative densities of the composites decreased from 96.1 % to 92.0 % with increasing zirconia content up to 5 wt. %. The results of the electrical test on the composites indicated that electrical conductivity reduced gradually with increase in reinforcement content. SEM and EDS studies showed that Cu-ZrO_2 composites have a uniform microstructure in which zirconia particles are distributed uniformly in the Cu matrix.

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