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Influence of Thermal Cycling on Properties of Al Based MMC's reinforced by Ceramic Fibres

Norbert Hort and Karl Ulrich Kainer
GKSS Forschungszentrum Geesthacht GmbH

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An aluminium piston alloy AlSi12CuNiMg was investigated in the unreinforced and the reinforced condition. Different types of ceramic fibre reinforcements were used (Saffil, Kaowool, Maftec and Superwool). The fibres were converted into performs. As infiltration process the squeeze casting process was chosen. This process is giving a good choice in process parameters for obtaining fully dense parts for the unreinforced matrix alloys as well as for reinforced metal matrix composites. This results in a fine grain structure and in optimum mechanical properties. Moreover the reproducibility during processing is guaranteed. During processing the performs were preheated up to 1000℃ and the melt was superheated up to 800℃ to achieve a full infiltration of the performs used. For infiltration a pressure of 80 MPa was used followed by solidification under a pressure of 140 MPa. All materials were investigated in the reinforced and the unreinforced condition on their mechanical properties by means of tensile and compression testing.

The materials were investigated in the as cast condition (F) and in heat-treated condition. The investigations were completed by thermal cyclic treatment of selected specimens up to 250℃ and a following investigation on their behaviour during mechanical testing. The changes in properties are compared with result of standard piston material used in automotive industries. Microstructural investigations were performed by using standard optical methods and SEM.