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Aluminum Matrix Composites Reinforced by Glassy Carbon-Titanium Spatial Structure

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Abstract : This study presents aluminum matrix composites reinforced by glassy carbon (GC) and titanium (Ti). In the first step, the heterophase (GC+Ti), spatial form (similar to skeleton) of reinforcement was obtained via own method. The polyurethane foam (with spatial, open-cells structure) covered by suspension of Ti particles in phenolic resin was pyrolyzed. In the second step, the prepared heterogeneous foams were infiltrated by aluminium alloy. The manufactured composites are designated to industrial application, especially as a material used in tribological field. From this point of view, the glassy carbon was applied to stabilise a coefficient of friction on the required value 0.6 and reduce wear. Furthermore, the wear can be limited due to titanium phase application, which reveals high mechanical properties. Moreover, fabrication of thin titanium layer on the carbon skeleton leads to reduce contact between aluminium alloy and carbon and thus aluminium carbide phase creation. However, the main modification involves the manufacturing of reinforcement in the form of 3D, skeleton foam. This kind on reinforcement reveals a few important advantages compared to classical form of reinforcement-particles: possibility to control homogeneity of reinforcement phase in composite material; low-advanced technique of composite manufacturing-infiltration; possibility to application the reinforcement only in required places of material; strict control of phase composition; High quality of bonding between components of material. This research is founded by NCN in the UMO-2016/23/N/ST8/00994.

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