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Research of obtaining of composite materials based on aluminum matrix

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ABSTRACT

In this work was studied the processing of aluminum alloys (silumins) by ligatures containing various carbon modifications (in the form of microcrystalline graphite, nanocarbon additives in the form of fullerenes, fullerene soot, and fullerene niello) when casting-deformation technology of the manufacturing of products. In the work, the elemental and phase composition, structural state, and mechanical and tribological properties of the initial components of the charge in the Al–C and Al–Si–C after its mechanical activation alloys after severe plastic deformation (extrusion) of the charge and cast aluminum workpieces after processing by ligatures were studied. Gradually, the processes of structure formation of alloys in the system Al–C and Al–Si–C when they are received and thermomechanical loading are studied. Of particular interest is the formation of superhard carbon phases in ligatures where instead of microcrystalline graphite nanocarbon additives were used. Using spectroscopy of combined light scattering was revealed that these amorphous phase, similar to glassy carbon. In ligatures, carbides of aluminum Al_4C_3 and/or silicon SiC (during annealing (800°C, 30 min) to 10–12% carbides) were also identified. Such structural state of alloys obtained when the activation of the charge (mechanical activation in dispersive devices and at intensive plastic deformation) determines the prospects of their use as additives providing not only dispersed hardening but also the modification of the alloy when creating composites characterized by high anti-friction, plastic, and strength properties.

KEYWORDS: fullerene niello, fullerene soot, casting, deformation, Al alloy