Structure Peculiarities of Nanocomposite Powder $Fe40Al/Al_2O_3$ Produced by MASHS

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Abstract

Structure investigation results for MASHS powder $Fe40Al/Al_2O_3$ are presented. The powder was produced in technological combustion mode from mechanically activated charge mixture ($Fe+Al+Fe_2O_3$). The powder structure formation proceeds via two stages. On the first step (mechanical activation) aluminothermal reaction takes plays, leading to formation of nanocomposite precursor $Fe-Al-Al_2O_3$. The precursor is characterized by the few levels of heterogeneity: micrometric lamellae's consist of nanosized phase mixture (grain size of the composite is from 10 up to 75 nm). On the second step (SHS) iron and aluminum reacts forming intermetallic FeAl. As-synthesized composite powder completely inherit the precursor morphology (micrometric lamellae's can be distinguished in the MASHS product in spite of the phase transformations). Grain size of the synthesized powder is some higher (from 20 to 150 nm) but it is still nanocomposite. Such a production route provide an improved interfacial strength of the composite (no debonding at intermetallic/oxide interfaces was observed).

Effect of Working Temperature on Microstructure and Mechanical Property of Ultrafine Grained Al and Al-5vol.%SiC_p Composite Processed by Accumulative Roll-bonding

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Abstract

The effect of working temperature on microstructure and mechanical properties of ultrafine grained monolithic Al and Al-5vol.%SiC_p composite processed by accumulative roll bonding was studied. The ARB was performed up to eight cycles (an equivalent strain of ~6.4) without lubricant. The working temperature is varied from ambient temperature to 200°C. The samples processed at temperatures below 100°C exhibited an ultrafine grained structure over almost all regions. However, the samples processed at 200°C showed an inhomogeneous structure in which a few coarse grains due to an occurrence of conventional recrystallization is partially seen. The tensile strength of both the monolithic Al and the composite decreased with increasing the ARB working temperature. The variation of microstructure and mechanical properties of the composite with the working temperature was compared to that of the monolithic aluminum.

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