Vacuum

Investigation into the thermal behaviour of the B2–NiAl intermetallic alloy produced by compaction and sintering of the elemental Ni and Al powders

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Abstract

A cubic B2–NiAl alloy was synthesized by mixing of elemental Ni and Al powders followed by cold compacting and sintering of some samples at 750 °C and other samples at 1300 °C. The alloys sintered at 1300 °C exhibited a brittle B2–NiAl structure easily crushable into powder, while the 750 °C sintered alloys were not nearly as brittle. Electron Backscatter Diffraction (EBSD) results show that the B2–NiAl alloy sintered at 750 °C for a longer time (120 h) has larger grain size associated with the <111>-oriented grains encountering high mobility boundaries than the alloy sintered at 750 °C for a shorter time (48 h). Samples morphologies were analyzed using the Scanning Electron Microscope (SEM). Structural development of the alloy was studied via the x-ray diffraction (XRD) technique. The B2–NiAl intermetallic developed a thin scale of stable Al2O3 alloy due to oxidation in air at 750 °C for 120 h. As a result, further oxidation on the sample's surface was restricted, except the traces of Al2O3 formed via intergranular oxidation transformed into a metastable monoclinic oxynitride phase due to nitrogen (N) contamination.