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USING ACCUMULATIVE ROLL BONDING TO PROCESS ULTRAFINE GRAINED TITANIUM-ALUMINUM-NIOBIUM ALLOYS

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Abstract

Accumulative roll bonding (ARB) was used to process Ti-Al and Ti-Al-Nb alloys from elemental titanium, aluminum, and niobium foils. The sheets were severely deformed by repeated cold rolling with interspersed folding of the sheets. Following severe plastic deformation, the specimens were annealed at various temperatures below the melting point of aluminum. The structural evolution of the resulting material was investigated and characterized using transmission electron microscopy (TEM), scanning electron microscopy (SEM), x-ray diffraction (XRD), and differential scanning calorimetry (DSC). Tensile testing and microhardness testing were used to evaluate the mechanical properties of the resulting multilayered specimens. TEM analysis showed the formation of ultrafine, submicron grains as a result of severe plastic deformation. For all of the annealed specimens, the intermetallic compound TiAl3 was observed to form at the Ti/Al interfaces with the specimens that were subjected to the most deformation prior to annealing exhibiting the greatest amount of TiAl3.

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