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# STRUCTURE-PROPERTY RELATIONSHIP OF ULTRAFINE GRAINED TITANIUM-ALUMINUM-NIOBIUM ALLOYS PROCESSED BY ACCUMULATIVE ROLL BONDING

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**Abstract**

The severe plastic deformation process of accumulative roll bonding (ARB) was used to process ultrafine grained Ti-Al and Ti-Al-Nb alloys from elemental titanium, aluminum, and niobium foils. The multi-layered foils were subjected to various ARB cycles that consisted of repeated cold rolling with interspersed folding of the foils. The structure-property relationship between the number of ARB cycles and the resulting grain size was investigated and characterized using transmission electron microscopy (TEM), scanning electron microscopy (SEM), x-ray diffraction (XRD), tensile testing and microhardness testing. TEM analysis showed the formation of ultrafine, submicron grains as a result of increasing ARB cycles. The reaction kinetics of solid-state phase transformations that occurred after annealing were also investigated as a function of ARB cycles. A relationship between the grain size and reaction kinetics was developed.

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