

Analysis of the Mechanical Behavior of Incoloy[®] 945 Processed by Cold Lamination at Different Heat Treatments

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The Incoloy[®] 945, a nickel superalloy containing a nominal composition of Ni-47.0Fe-20.5Cr-3.0Mo-2.0Cu-3.0Nb-1.5Ti (wt%), result from development of Special Metals Co. (located in West Virginia, USA) in a hybrid alloy between Inconel[®] 718 and Incoloy[®] 925, obtaining an excellent mechanical strength and corrosion, employed primarily for applications in oil and natural gas (O&G). In this paper, show the mechanical behavior of the material, work-hardened 15, 25 and 35% reduction, using the cold rolling process, in two different routes of heat treatments. These heat treatments follow the commercial route, developed by Special Metals Co. and a new experimental route developed at IPEN (Institute of Energy and Nuclear Research). Performing mechanical tensile tests, it was shown that in both different heat treatments the mechanical strength of the material ranged from 1 to 3%, but the samples were treated with an experimental route demonstrated greater ductility (about 2%) than the treated material with heat treatment developed by Special Metals Co. We used electron microscopy (SEM) to display microstructure showing that the heat treatment developed by IPEN, has a smaller grain size and lower presence of carbides and nitrides formed over the matrix, compared to the samples treated in the treatment thermal developed by Special Metals Co. It's also shown that titanium nitrides (formed during the alloying casting process) after mechanical processing (lamination) for cracks inside indicating weakness that may influence the structural alloy appearance.