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“Peritectoid Phase Transformations in Ni$_3$Mo Alloy”

Abstract

High-energy ball milling was used to produce a partially alloyed elemental nickel and molybdenum of Ni$_3$Mo composition, cold-compacted and then sintered/solutionized at 1300°C for 100 h and subsequently quenched to retain the α-solid solution. Three transformation studies were performed. First, the intermetallic Ni$_3$Mo was formed from the supersaturated solution at temperatures below the peritectoid isotherm. Cellular precipitation was observed in some samples. The second experiment involved the reversed peritectoid transformation from Ni$_3$Mo to Ni(Mo) solid solution and NiMo. Regardless of heat-treatment temperature, samples heat-treated for short times exhibited small precipitates of NiMo phase along and within grain boundaries of Ni(Mo) solid solution. The third involved the transformation reaction from the supersaturated solution above the peritectoid temperature. Precipitates of NiMo were observed and additionally, spinodal structure with compositions of 14 and 19 at. % Mo developed in the solid solution matrix for most samples. In all three cases, hardness values increased and peaked in a way similar to that of traditional aging, except that the peak occurred much rapidly in the second and third cases.

Biosketch

Ibrahim Khalfallah graduated from Benghazi University, Libya, (2005) with a B.S. degree in Mechanical Engineering. He then worked at General Electrical Company as a maintenance engineer for two years. After that, he transferred to Benghazi for Soft Drinks Company for one year. He then obtained his M.S. degree in Mechanical Engineering from Benghazi University (2009). In 2011, he joined the MSE department to get his PhD.