WH-SMAs- Development of wide-hysteresis shape memory alloys

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The localized strain fields during the tensile stress-induced martensitic transformation (MT) in NiTiNb Wide Hysteresis Shape Memory Alloys (SMAs) are studied. NiTiNb alloys are a class of SMAs that exhibit a wide temperature hysteresis required for practical application. Previous investigators embedded Nitinol (NiTi) wires into concrete. The temperature hysteresis of NiTi (~30°C) is unsuitable for practical self-post tensioned bridge-girder applications. With the addition of Nb, the hysteresis can be widened up to (~145°C). The effects of Nb are attributed to the dispersion of a Nb rich second phase with the NiTi matrix. We hypothesize that by controlling the Nb content we can design microstructures and tailor NiTiNb for service temperature requirements. This work represents the initial thermo-mechanical experimentation towards an understanding of the relationship between the material response and the underlying MT morphology. For a commercial NiTiNb, we interpret the MT morphology, in-situ, based on full-field deformation and strain measurements obtained using DIC. To elucidate, the influence of Nb, the results are contrast with those for a binary NiTi SMA.

Biography

Reginald F Hamilton has completed his PhD in 2008 and Postdoctoral studies in 2010 from the University of Illinois Champaign-Urbana Mechanical Science and Engineering Department. He is currently an Assistant Professor of Engineering Science at The Pennsylvania State University, University Park Campus. He is the Director of the Multifunctional and Adaptive Materials Laboratory at Penn State University. He has published many publications on shape memory alloys and the martensitic transformation in reputable journals.

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