November 27 28 29
ICEUBI 2019
University of Beira Interior
Faculty of Engineering   Covilhã :: Portugal

Matlab® algorithm to simulate the dynamic behavior of an NiTi alloy through Ansys® APDL™ models

Jean César Hilário, Polytechnic Institute of Bragança, a39513@alunos.ipb.pt
Manuel Braz César, Polytechnic Institute of Bragança, brazcesar@ipb.pt
Carlos Alberto Rodrigues Andrade, Polytechnic Institute of Bragança, andrade@ipb.pt
Adaílton Silva Borges, Federal Technological University of Paraná, adailton@utfpr.edu.br

Abstract

In recent years, technological advances related with the so-called intelligent materials have been exploited for problem solving in many engineering fields. In this regard, shape memory alloys (SMA) seem suitable for medical and engineering applications and many others. These alloys have the ability to return the original form after an apparently plastic deformation by applying heat and the also ability to perform phase changes with voltage variations under a specific temperature. These properties allow the development of a hysteretic loop with energy dissipation, which can be used as a damping element in a vibratory system. In this paper, a MATLAB® algorithm was developed to create an interface with the Ansys® APDL™ software that simulate the dynamic behavior of a SMA. The software is capable to obtain the cyclical behavior of a vibratory mechanical system based on the energy dissipation properties of the SMA. The results shown that the free vibration of a mass-damper (alloy) system presents the energy dissipation related in magnitude with the area of the hysteresis loop until the deformation caused by the motion which does not correspond to a voltage required to initiate the (direct) phase transformation of the material, thus reducing the displacement to a constant level.

Keywords

SMA, ANSYS® APDL™, Matlab®