

Phase Transformation Behaviors in Hydrogen-Charged Ti-Ni Shape Memory Alloy

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Title Phase Transformation Behaviors in Hydrogen-Charged Ti–Ni Shape Memory Alloy
(水素チャージ Ti–Ni 形状記憶合金の相変態挙動)

ABSTRACT

In this research, the author studied the influences of hydrogen charging on the martensitic transformation in Ti–Ni alloy by employing various experimental methods, such as differential scanning calorimetry (DSC), scanning electron microscopy (SEM), thermal desorption spectroscopy (TDS), Vickers hardness measurement, and so on. The content of each chapter of this thesis is briefly described as follows:

Chapter 1 describes an introduction, containing fundamental information about the Ti–Ni shape memory alloy, hydrogen in the alloy, and the motivation objectives of this research.

Chapter 2 explains details about the experimental and the materials used in this research.

Chapter 3 introduces new phases discovered in this study. The high-hardness layer, called “hydrogen-induced martensite” (HIM), is formed by the hydrogen charging. The hydrogen charging also forms an untransformed layer called “hydrogen-affected layer” (HAL) between the HIM and the B19’ martensite.

Chapter 4 focuses on the influences of the duration of hydrogen charging on the phase transformation in Ti–Ni alloy. How the HIM, HAL, and the transformation temperatures change with the hydrogen charging duration will be described.

Chapter 5 describes the dynamics of the aging treatments after the hydrogen charging. The transformation temperatures decrease with the aging treatments. The growth of HIM and HAL also occurs with the aging treatment.

Chapter 6 describes the aging treatment conditions after the hydrogen charging on the phase transformation behavior. The aging treatments around room temperatures change in the transformation temperatures. The isothermal nature of HIM will also be discussed.

Chapter 7 summarizes the outcomes of this research with some comments on perspective views in this research field.