

**Title:**

Effect of Hydrogen Embrittlement Towards Thermal and Mechanical Behavior of NiTi Shape Memory Alloy

**Journal:**

IOP Conference Series: Materials Science and Engineering, Volume 920, Issue 118, September 2020

**Document Type:**

Conference Paper (Open Access)

**Authors:**

Ng, C.W.,  
Mahmud, A.S.,  
Razali, M.F.,  
Ahmad, M.N.  
[mohdnizam@unikl.edu.my](mailto:mohdnizam@unikl.edu.my)

**Full text link:**

Publisher : <https://iopscience.iop.org/article/10.1088/1757-899X/920/1/012033>

**Scopus preview**

<https://www.scopus.com/inward/record.uri?eid=2-s2.0-85092627072&doi=10.1088%2f1757-899X%2f920%2f1%2f012033&partnerID=40&md5=6421104e2da7f13511161c57de533e1d>

**Citation:**

Ng, C.W., Mahmud, A.S., Razali, M.F., Ahmad, M.N. Effect of hydrogen embrittlement towards thermal and mechanical behavior of NiTi shape memory alloy (2020) *IOP Conference Series: Materials Science and Engineering*, 920 (1). DOI: 10.1088/1757-899X/920/1/012033

**Abstract:**

NiTi arch wires are susceptible to hydrogen embrittlement upon contact with dental brackets in oral cavity during orthodontic treatment. This study investigated the effect of hydrogen absorption and diffusion over time towards the thermal and mechanical properties of NiTi shape memory wire. The hydrogen absorption process was carried out via electrolytic charging at constant current density for 16 hours in 1.0 weight percent (wt.%) sodium sulphate solution. The hydrogen charged wires were aged at room temperature in air for different durations to allow further inward diffusion of the hydrogen into the specimens. The results show that after hydrogen charging, the latent heat of forward and reverse martensitic phase transformation of the NiTi wire changed from 19.96 to 11.98 J/g, and 19.21 to 13.42 J/g, respectively. Further suppression and disappearance of thermal transformation peaks were observed as the charged specimen aged for 7 days. The transformation stress level on tensile deformation increased by almost 90 MPa after hydrogen charging, and exhibited non-flat stress plateau after further aging.