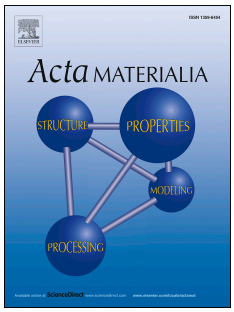
Accepted Manuscript



Fracture Toughness of NiTi–Towards Establishing Standard Test Methods for Phase Transforming Materials

Behrouz Haghgouyan, Ceylan Hayrettin, Theocharis Baxevanis, Ibrahim Karaman, Dimitris C. Lagoudas

PII: S1359-6454(18)30760-2

DOI: 10.1016/j.actamat.2018.09.048

Reference: AM 14857

To appear in: *Acta Materialia*

Received Date: 23 February 2018

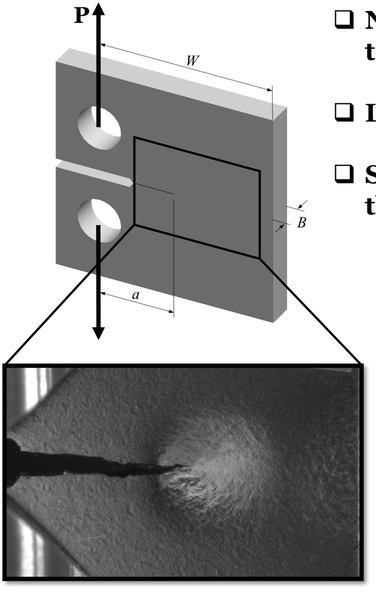
Revised Date: 22 September 2018

Accepted Date: 23 September 2018

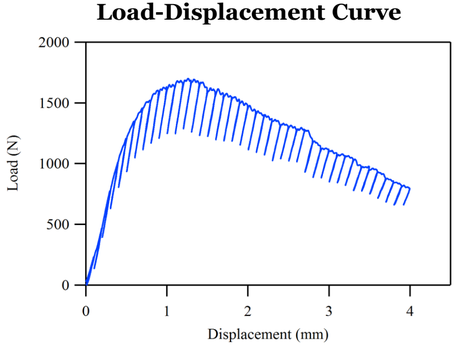
Please cite this article as: B. Haghgouyan, C. Hayrettin, T. Baxevanis, I. Karaman, D.C. Lagoudas, Fracture Toughness of NiTi–Towards Establishing Standard Test Methods for Phase Transforming Materials, *Acta Materialia* (2018), doi: https://doi.org/10.1016/j.actamat.2018.09.048.

TEST METHOD FOR MEASURING FRACTURE TOUGHNESS IN THE PRESENCE OF MARTENSITIC TRANSFORMATION:
Fracture toughness of NiTi

Measurement of Fracture Toughness from Single CT Specimen



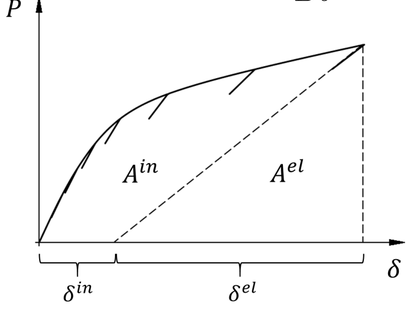
- Near-equiatomic NiTi CT specimens are tested under mode-I, isothermal loading
- Load-load line displacement is recorded
- Stable crack growth is observed throughout the tests



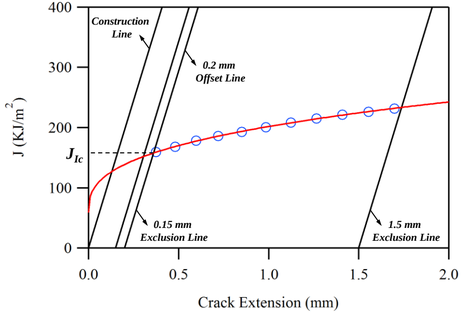
Data Analysis
relies on ASTM E180 but differs from it…

- … in that it takes into account the transformation /detwinning-induced changes in the apparent elastic properties in determining the J-integral

$$J = J^{el} + J^{in} = \frac{\eta^{el} A^{el}}{Bb} + \frac{\eta^{in} A^{in}}{Bb}$$



- J-R curve is developed by fitting a power-law regression line to J versus crack extension data
- The intersection of regression line and 0.2 mm offset line defines the critical value, J_{IC}



Fracture Toughness, J_{IC}

- The fracture toughness of martensitic and pseudoelastic materials is relatively close
- The fracture toughness of stable austenite is considerably higher