

# Accepted Manuscript

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

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PII: S1359-6454(18)30760-2

DOI: [10.1016/j.actamat.2018.09.048](https://doi.org/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

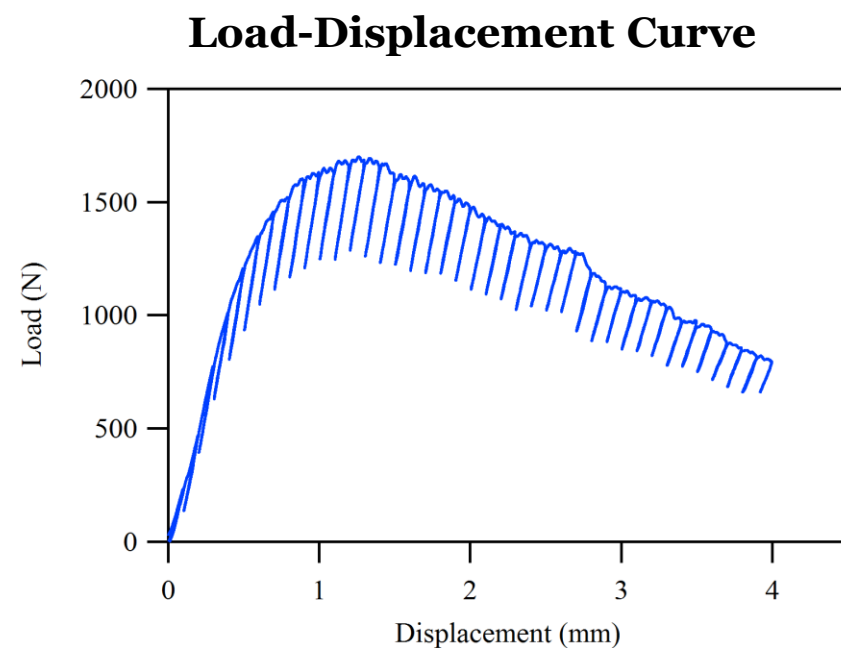
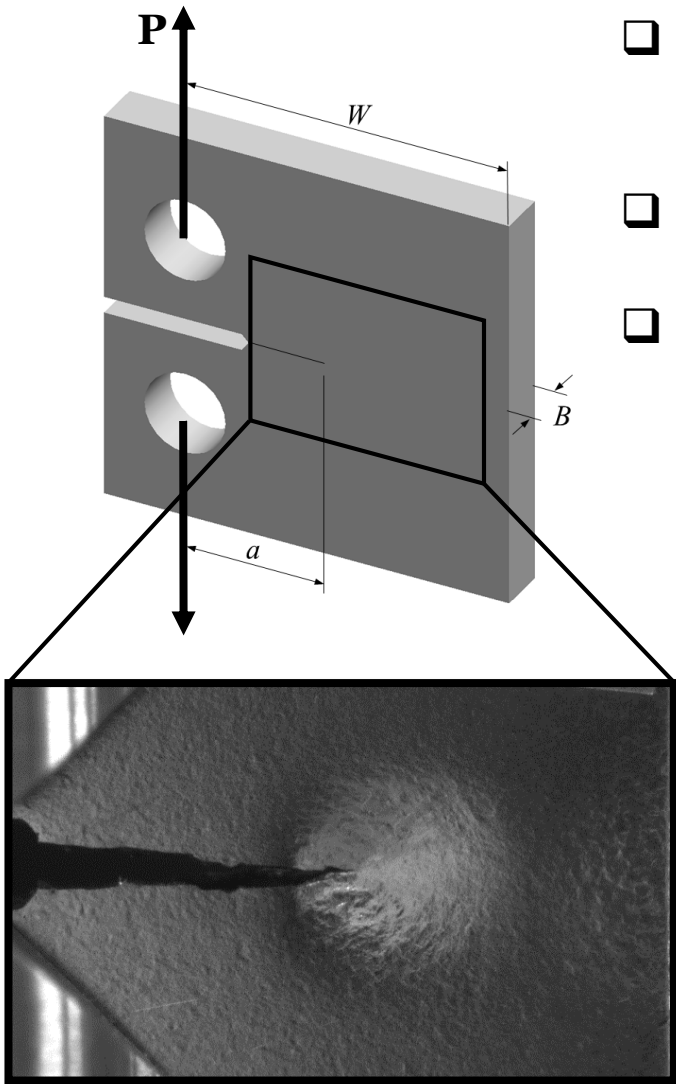
Please cite this article as: B. Haghgouyan, C. Hayrettin, T. Baxevanis, I. Karaman, D.C. Lagoudas, Fracture Toughness of NiTi–Towards Establishing Standard Test Methods for Phase Transforming Materials, *Acta Materialia* (2018), doi: <https://doi.org/10.1016/j.actamat.2018.09.048>.

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# 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

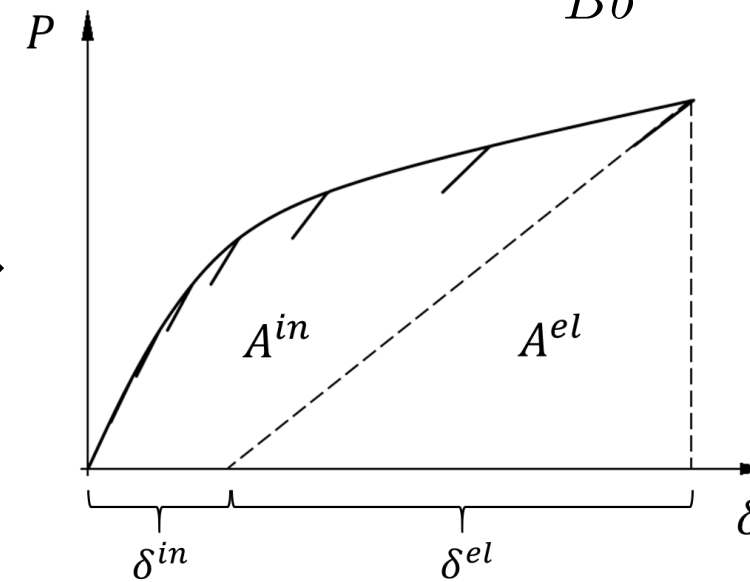


## Data Analysis

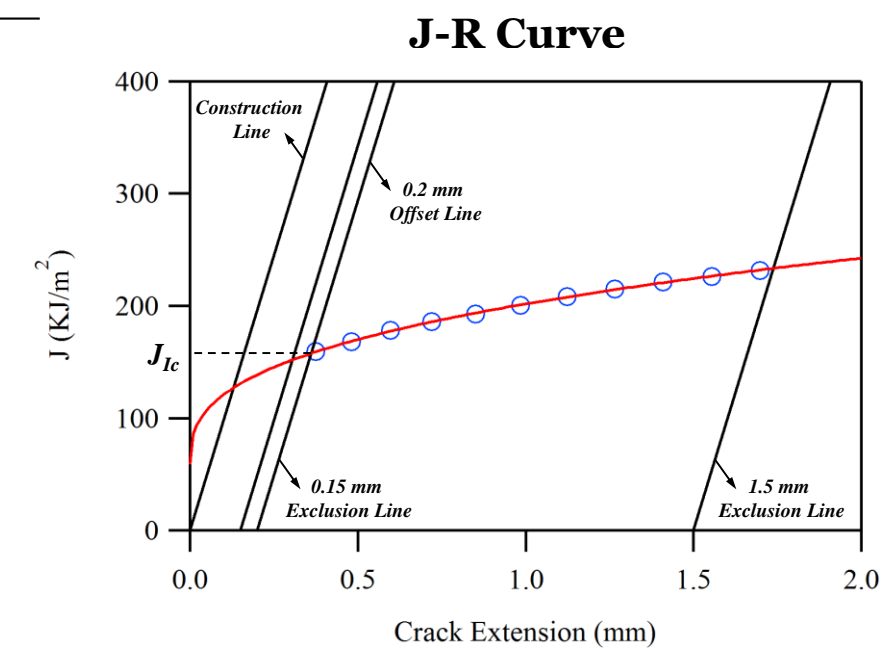
relies on ASTM E180 but differs from it...

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

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

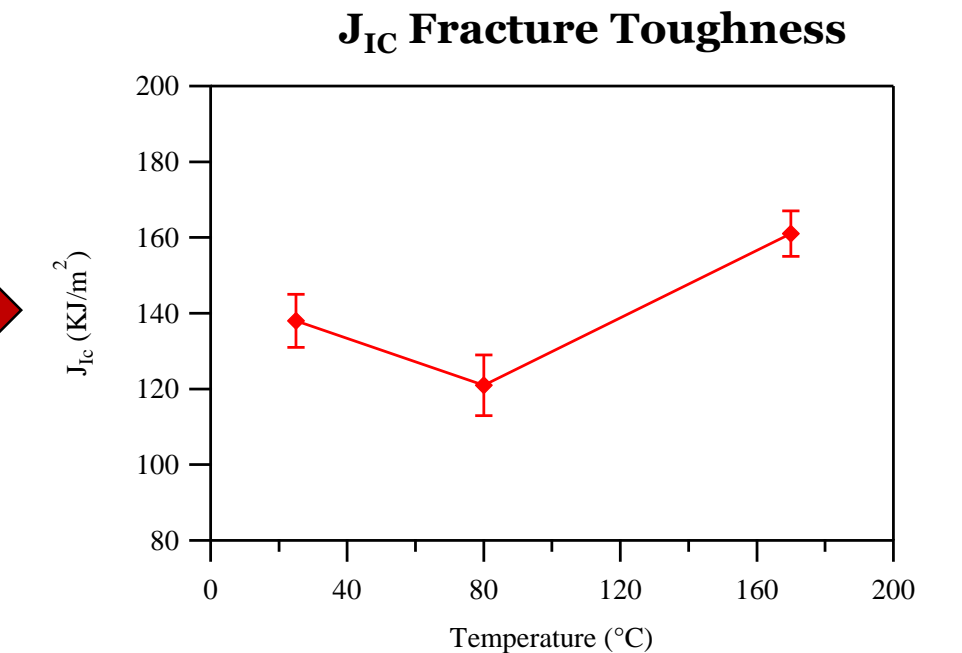


- ❑ J-R curve is developed by fitting a power-law regression line to J versus crack extension data
- ❑ The intersection of regression line and 0.2 mm offset line defines the critical value, J<sub>IC</sub>



## Fracture Toughness, J<sub>IC</sub>

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



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