

Accepted Manuscript

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PII: S0142-1123(18)30189-0

DOI: <https://doi.org/10.1016/j.ijfatigue.2018.05.018>

Reference: JIJF 4690

To appear in: *International Journal of Fatigue*

Received Date: 23 March 2018

Revised Date: 8 May 2018

Accepted Date: 14 May 2018



Please cite this article as: Wang, X.G., Ran, H.R., Jiang, C., Fang, Q.H., An energy dissipation-based fatigue crack growth model, *International Journal of Fatigue* (2018), doi: <https://doi.org/10.1016/j.ijfatigue.2018.05.018>

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An energy dissipation-based fatigue crack growth model

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Abstract:

This paper presents a local approach to analyze the fatigue crack growth rate (FCGR) through the characterization on the dissipative process of fatigue crack tip zone. An energy dissipation-based FCGR model is established, and a dedicated thermographic method for dissipated energy assessment in the cyclic plastic zone is developed. Fatigue crack growth tests are conducted on the 316L steel under the varied stress ratios. The results demonstrate that the fatigue crack growth process can be well characterized by the near-tip energy dissipation. The proposed FCGR model shows, however, an unexpected stress-ratio-dependence. This dependence is analyzed by the crack closure effect, and the FCGR model is improved by introducing an effective energy dissipation rate concept.

Keywords:

Fatigue crack growth; Fatigue test methods; Energy dissipation; Thermography; Crack closure.

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