

Accepted Manuscript

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PII: S0142-1123(18)30549-8

DOI: <https://doi.org/10.1016/j.ijfatigue.2018.09.006>

Reference: JIJF 4841

To appear in: *International Journal of Fatigue*

Received Date: 22 June 2018

Revised Date: 13 September 2018

Accepted Date: 19 September 2018



Please cite this article as: Yu, Z., Shan, Z., Mao, J., Fatigue deterioration of quasi-brittle materials, *International Journal of Fatigue* (2018), doi: <https://doi.org/10.1016/j.ijfatigue.2018.09.006>

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Fatigue deterioration of quasi-brittle materials

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Received 20 June 2018

Revised 13 September 2018

Abstract. In this work, the fatigue deterioration of the quasi-brittle materials under cyclic tension is investigated both theoretically and experimentally by considering concrete as a specific example. The deterioration relates to the total strain, residual strain and Young's modulus are found to evolve in a three-stage process during the lifetime. A novel theoretical approach, namely, a fiber bundle-plastic chain model, is introduced to explain these behaviors. This model captures the major microscopic mechanisms of the fatigue deterioration of quasi-brittle materials, and provides a good agreement with the experimental findings.

Keywords: Statistics; Quasi-brittle materials; Fatigue; Fracture; Plasticity

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