



entropy



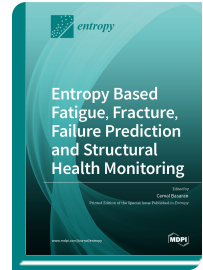
Special Issue Reprint

Entropy Based Fatigue, Fracture, Failure Prediction and Structural Health Monitoring

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Traditionally fatigue, fracture, damage mechanics are predictions are based on empirical curve fitting models based on experimental data. However, when entropy is used as the metric for degradation of the material, the modeling process becomes physics based rather than empirical modeling. Because, entropy generation in a material can be calculated from the fundamental equation of the material. This collection of manuscripts is about using entropy for "Fatigue, Fracture, Failure Prediction and Structural Health Monitoring". The theoretical paper in the collection provides the mathematical and physics framework behind the unified mechanics theory, which unifies universal laws of motion of Newton and laws of thermodynamics at ab-initio level. Unified Mechanics introduces an additional axis called, Thermodynamic State Index axis which is linearly independent from Newtonian space x, y, z and time. As a result, derivative of displacement with respect to entropy is not zero, in unified mechanics theory, as in Newtonian mechanics. Any material is treated as a thermodynamic system and fundamental equation of the material is derived. Fundamental equation defines entropy generation rate in the system. Experimental papers in the collection prove validity of using entropy as a stable metric for Fatigue, Fracture, Failure Prediction and Structural Health Monitoring.



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