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Proposal of Crack Propagation Criterion Considered Constraint Effect under Extremely Low Cycle Fatigue; Evaluation by 1T-CT and 2T-CT Specimen

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It is important to understand unstable fatigue fracture mechanism because fracture accident is occupied fatigue 80% of the total [1]. However, a highly reliable evaluation method for under extremely low cycle fatigue caused by earthquakes has not yet been developed because of variable fracture toughness due to the constraint effect with large deformation.

Crack propagation criterion proposed in the previous study was validated under restricted condition [2], however it wasn't considered constraint effect. The objective of this study is the proposal of crack propagation criterion considered constraint effect under extremely low cycle fatigue.

As a matter of procedure, we model compact tension specimen finite element it was used in the previous study changed the thickness which is one of the constraint effect. And then after analysis which simulates behavior based on the experiment, we conducted validation applied crack propagation criterion which was proposed in previous study.

As a result, analysis applied crack propagation criterion in the previous study was obtained good accuracy. Crack shape was formed following distribution of effective plastic strain in thickness dimension. As a reason for that contribution ratio of effective plastic strain in crack propagation criterion is higher than stress triaxiality. In the presentation, crack shape in the analysis will be discussed after re-examination the contribution ratio in physical quantities and the method of evaluation.

The crack propagation criterion in the previous study is confirmed validity in several cases of thickness. We'd like to discuss validity in cases of different material properties, specimen shapes and crack shape.

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