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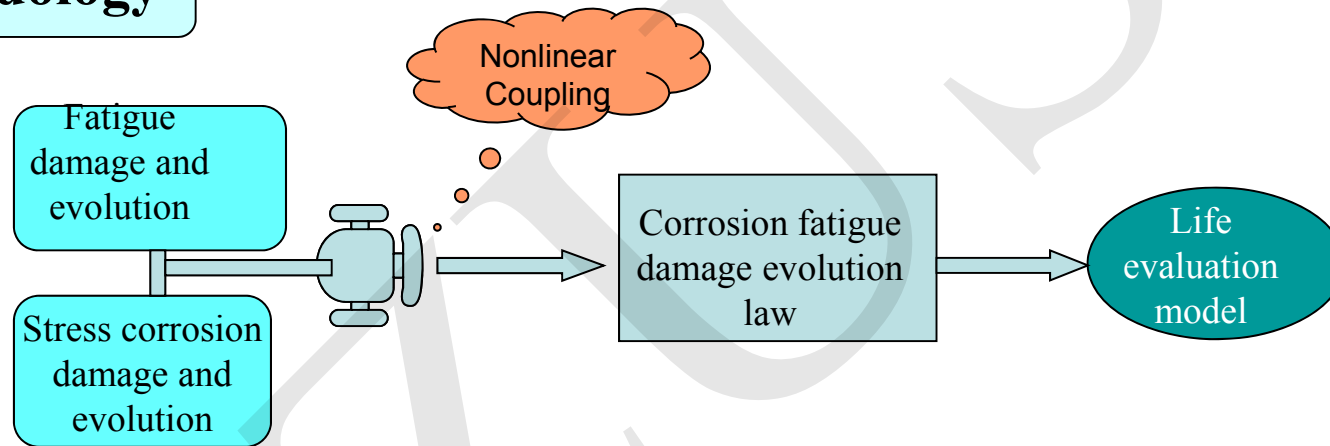
A nonlinear cumulative evolution model for corrosion fatigue damage

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Key objective

To deduce the evolution law of corrosion fatigue damage, and establish the corrosion fatigue life evaluation model

Key methodology



Major aspects investigated

1. To establish the nonlinear damage evolution model of corrosion fatigue
2. To carry on the stress corrosion and corrosion fatigue experiments
3. To determine the damage parameters of nonlinear damage evolution model

Experimental results

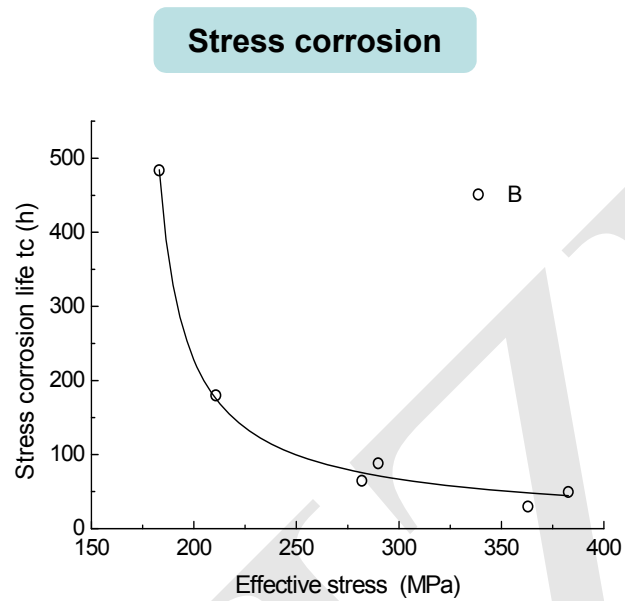


Fig. 1. Stress corrosion life curve of LY12CZ aluminum

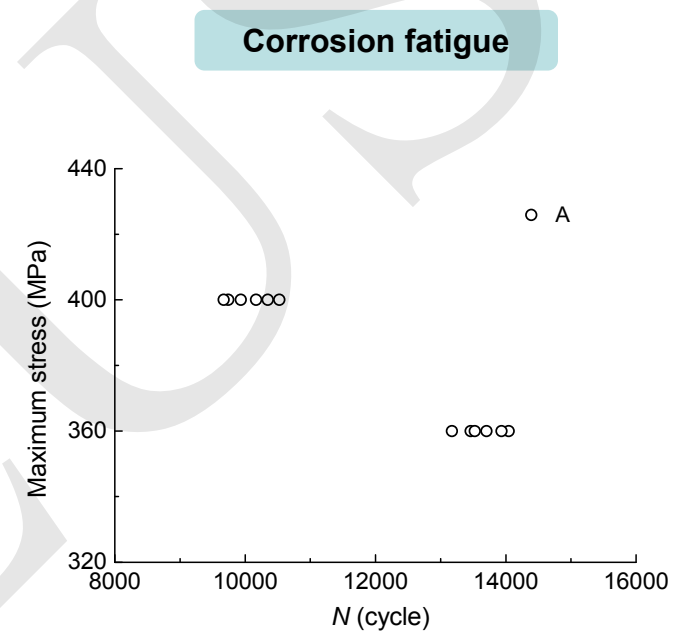


Fig. 2 The S-N data of corrosion fatigue

Model verification

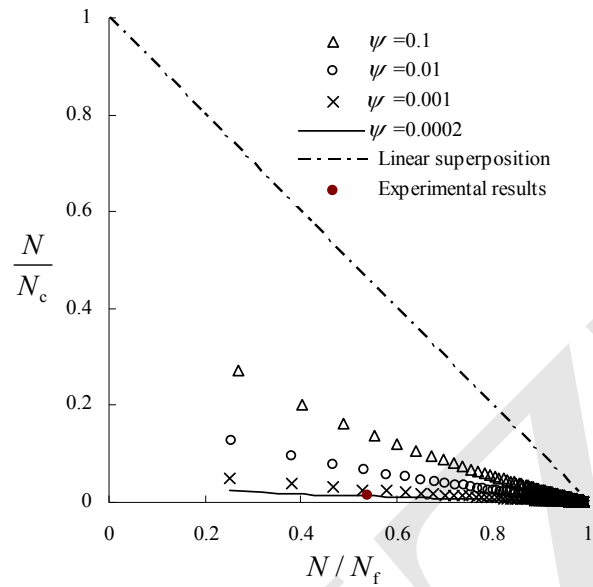


Fig. 3 Corrosion fatigue damage life of LY12CZ aluminum alloy at 220 MPa

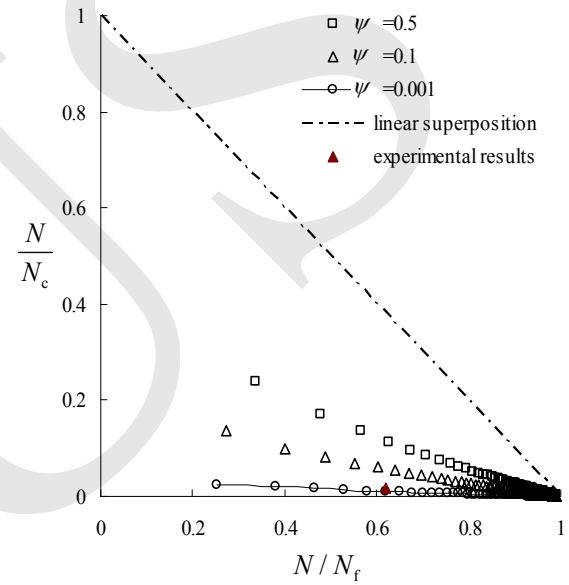


Fig. 4 Corrosion fatigue damage life of LY12CZ aluminum alloy at 198 MPa

Conclusions

- Corrosion fatigue damage is treated as the nonlinear accumulation of stress corrosion damage and fatigue damage.
- Combined with the experimental results of the LY12CZ aluminum alloy, the corrosion fatigue damage parameters are determined and the theoretical corrosion fatigue life prediction model of the LY12CZ aluminum alloy is established. This model can provide a new method for the theoretical study of corrosion fatigue and its life prediction.
- However, to reduce the number of damage parameters and for convenience of determining these damage evolution parameters, only the influence of alternating the stress amplitude on the damage evolution was considered in this paper, recognizing the uncertainty of the physical meaning of these parameters and the poor application of the corrosion fatigue damage model. At the same time, the corrosion fatigue damage evolution parameters may have certain differences for different materials. So the determination of the relative damage parameters should rely on the experimental data of the corresponding material. Thus the corrosion fatigue damage evolution model will be improved gradually.