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Relationship among S-N curves corresponding to different mean stresses or stress ratios

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Main goal and Innovation point

Main goal

- To study the intrinsic relationship among S-N curves corresponding to different mean stresses or stress ratios.

Innovation point

- A unified life evaluation formula for high cycle fatigue under different mean stresses or stress ratio has been deduced.

- The relationships between fatigue limit/proportional coefficient and mean stress have been proposed.

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Methods and Results

■ A new fatigue damage evolution law was proposed according to Kachanov's damage law.

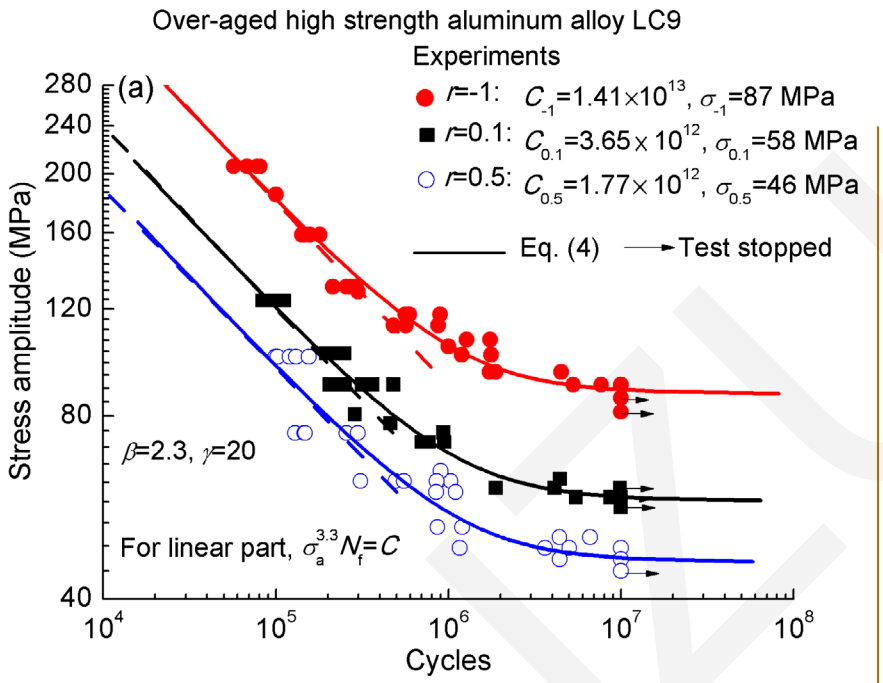

Fig. 1. Comparisons for fixed stress ratios

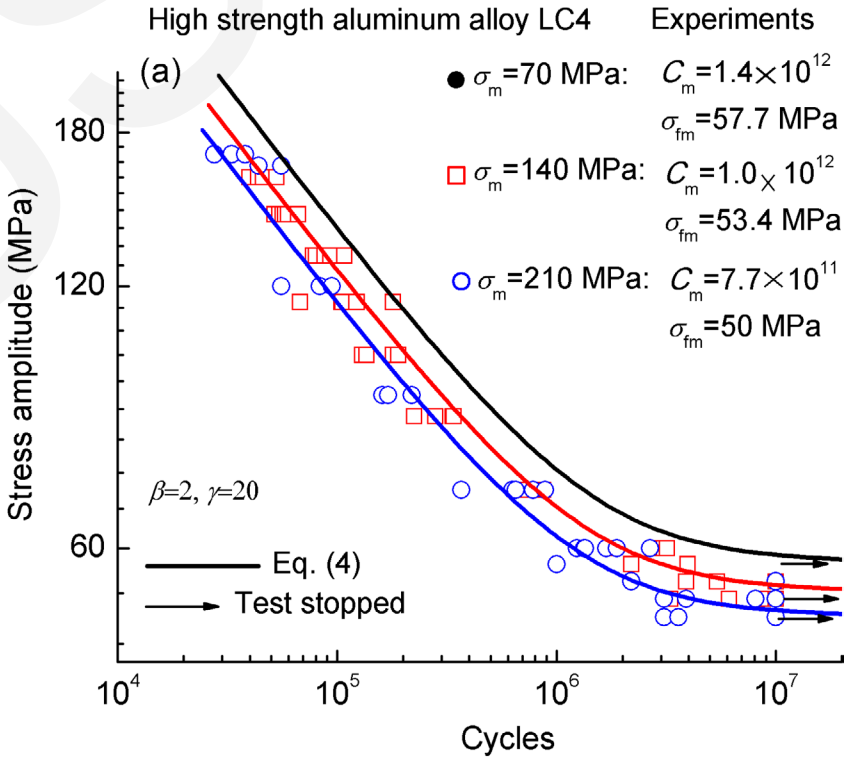

Fig. 2. Comparisons for fixed mean stress

Methods and Results

■ **Relationship between fatigue limit and mean stress was proposed.**

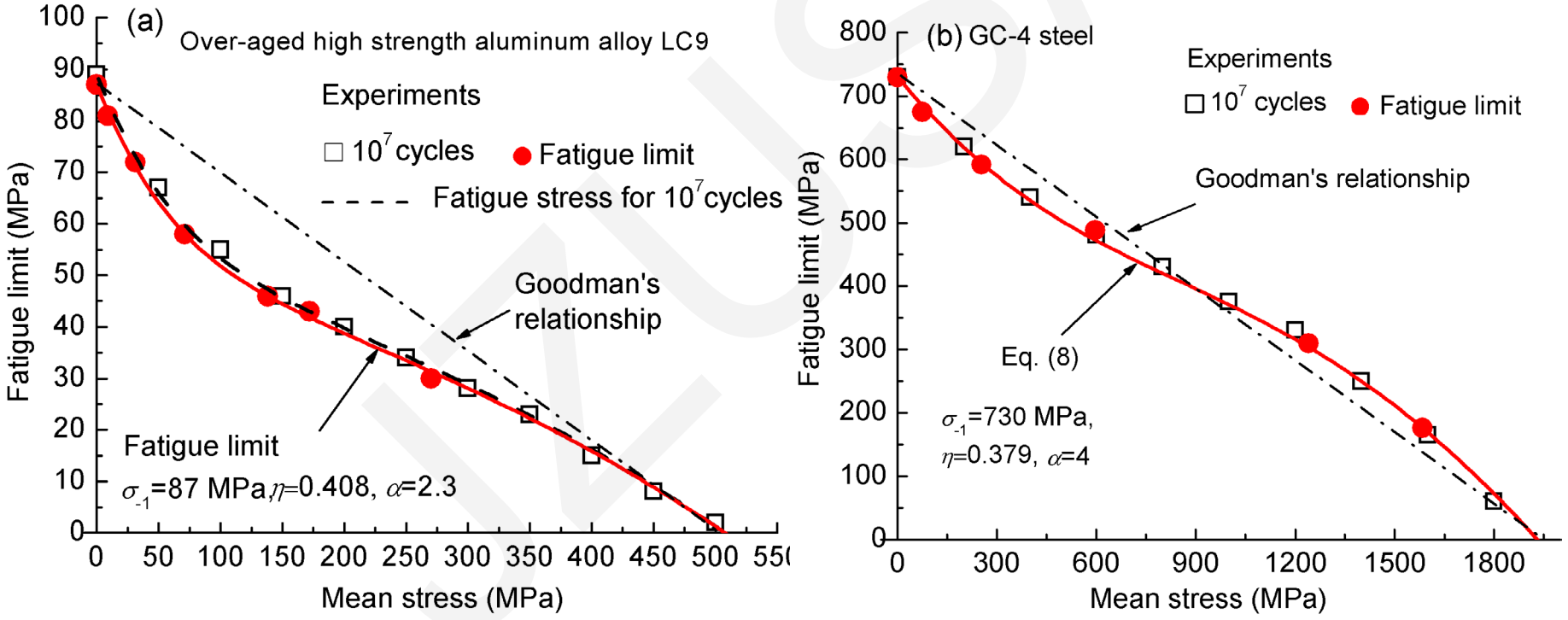

Fig. 3. Fatigue limit for various mean stress

Methods and Results

■ **By introducing equivalent symmetric stress amplitude and equivalent symmetric cycles, the unified evaluation formula was proposed under fixed mean stresses or stress ratios**

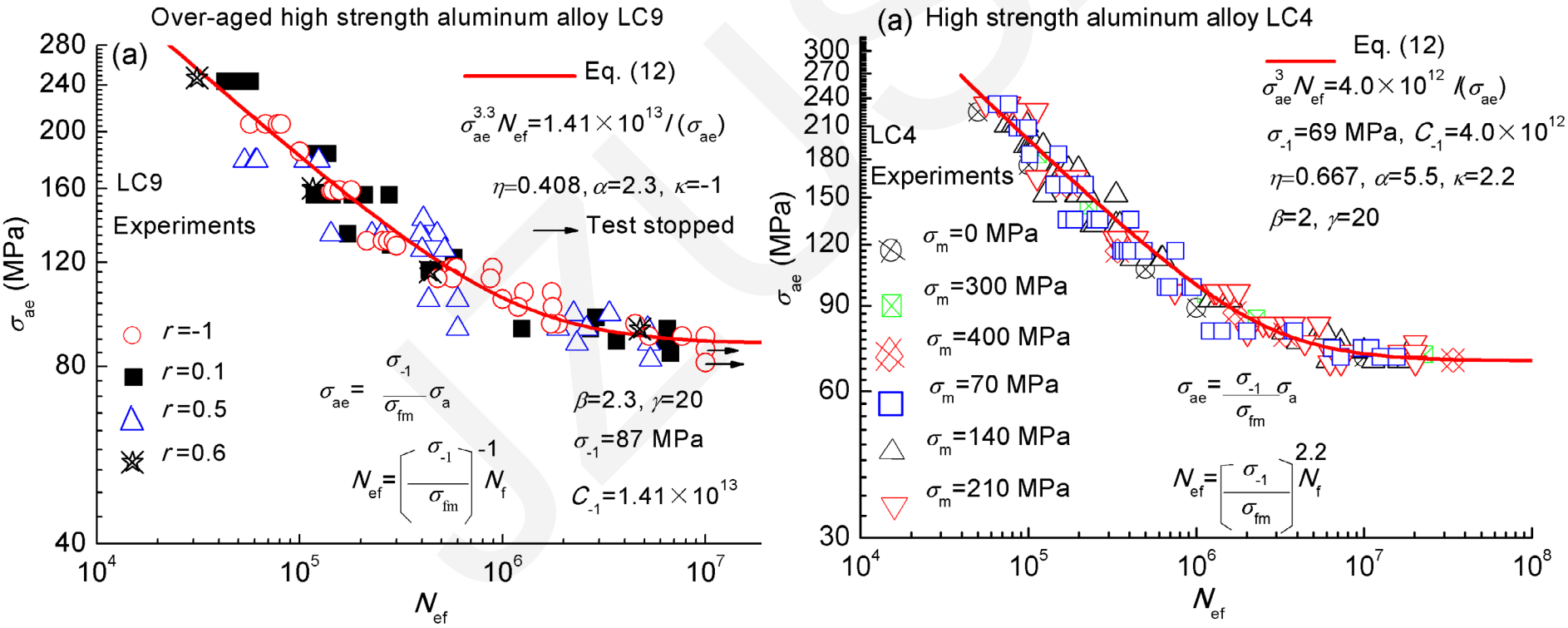

Fig. 4. Unified evaluation of fatigue life

Conclusions

- A damage evolution law which can describe the whole S-N curve has been proposed, and a fatigue life evaluation formula deduced.
- The empirical quantitative relationship between the fatigue limit and mean stress has been proposed and examined.
- The empirical relationship between the proportional coefficient and the fatigue limit has been proposed and examined.
- There is only one intrinsic S-N curve for a material from which all others under non-zero mean stress can be deduced.

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