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Influence of temperature on the low-cycle fatigue properties of compacted graphite iron

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Abstract: Strain-controlled low-cycle fatigue (LCF) tests at a fairly high strain rate were performed on as-cast compacted graphite iron (CGI) controlled with total strain amplitude at 25, 400 and 500 °C. The results show that CGI has the longest fatigue life, smallest stable hysteresis loop area at 400 °C. The reason is that the effective bearing size of the ferrite increases from 25 °C to 400 °C because slip deformation is retarded by carbon atom diffusion and carbide formation, and decreases from 400 °C to 500 °C because of the appearance of the ferrite grain boundary sliding. That effect of temperature is associated with the elastic strain amplitude instead of the plastic or stress strain amplitudes in macroscope. Finally the corresponding improvement suggestions based on these were also proposed.

Key words: Compacted graphite iron; Low-cycle fatigue; Temperature; Damage mechanism; Life prediction model.

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