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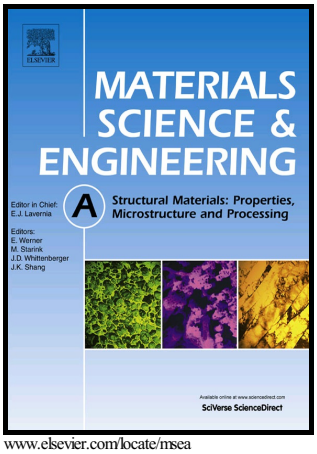


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# Investigation on tensile deformation behavior of compacted graphite iron based on cohesive damage model

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**Abstract:** Compacted graphite iron (CGI) is a typical engineering material with double phases, of which graphite morphology largely determines its mechanical performances. Although microstructural effects have been widely investigated, quantitative relations between mechanical properties and microstructures are still limited. In this study, a micro-scale damage cohesive finite element model (CFEM) was reconstructed and identified based on the tensile properties and damage characteristics of CGI, and then the effects of graphite including distribution, size, volume fraction and morphology on tensile behaviors were investigated. The agreement of yield strength and fracture mechanism between experimental and simulation results shows that the developed methods, combining the digital image-based technique (DIT) and CFEM, can be used to simulate CGI effectively. Furthermore, the quantitative relations between yield strength and microstructures were established. It is found that graphite distribution and volume fraction affect the yield strength much more compared with graphite size and morphology. Specifically, interesting results were found that yield strength does not monotonically change with volume fraction and aspect ratio of graphite, but reaches a maximum value under an optimal graphite size, which is in contrast to the traditional results. The established quantitative relations between microstructures and tensile properties of cast alloys can be utilized to design and manufacture the metallic composite with optimal mechanical properties.

**Keywords:** Compacted graphite iron; Graphite morphology; Cohesive finite element method; Yield strength.

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