

FRACTURE OF GREY CAST IRON

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Flexural testing and microstructural studies were carried out on ferritic grey cast iron after suitable heat-treatment. Examination of the microstructure of both the surface and the interior, before and after stressing, revealed that the formation of voids and volume changes accompany tensile loading. It was also observed that cracking does not originate at the tip of graphite flake but within the flake. The flake fractures along the longitudinal axis and then joins with another fractured flake, ahead of the main crack path. It is possible that graphite which has a hexagonal structure increases its volume under tension and helps to separate its weakly bonded basal planes. Microstructural examination of some specimens which were flexurally loaded to about 75% the mean fracture load showed evidence of cracking of graphite flakes, although there was no continuous cracking of the specimen. This result partly explains the bending of the stress-strain curve before yielding begins.

SECTION C

It is very likely that fracture in grey cast iron occurs first in the graphite clusters. Scanning electron micrographs showed large areas of graphite on the fracture surface. Ferrite in the matrix appears to resist the propagation of the main crack but as more graphite flakes fail—the ferrite being unable to carry the extra load—the ferrite matrix fails by forming voids.

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