DOI: 10.1017/S1431927603443717
Microsc Microanal 9(Suppl 2), 2003

INFLUENCE OF AUSTEMPERING TEMPERATURE ON MICROSTRUCTURE AND FRACTURE TOUGHNESS OF A SPHERODIZED GRAPHITE CAST STEEL

Susil K. Putatunda

Department of Chemical Engineering and Materials Science, Wayne State University, Detroit, Michigan 48202, USA

A new high carbon (1.00%), high silicon (3.0%) and high manganese (2.00%) spherodized graphite cast steel has been developed. This steel has been synthesized using the concepts from austempered ductile cast iron technology. In this investigation the influence of austempering temperature on the microstructure and the mechanical properties of this cast steel has been examined. Cylindrical tensile specimens and Compact tension specimens were prepared from this cast steel as per ASTM standards and were given four different austempering heat treatments to produce different microstructures. Tensile properties, fracture toughness and the stress corrosion crack growth behavior of these materials were studied in room temperature and ambient atmosphere. Test results indicate that by austempering at 316°C, more than 85% austenite was obtained in the microstructure. The fracture toughness is highest in this cast steel when the microstructure contains very high austenitic carbon (X□C□). It was also observed that blocky morphology of austenite is not beneficial for the mechanical properties of these materials.

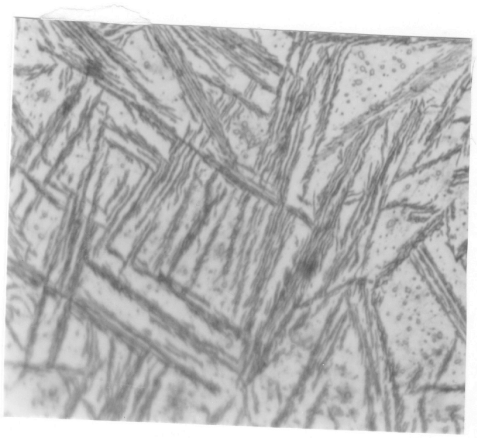

Fig 1: Microstructure of the Material (heat Treated Condition B). Magnification 1000X

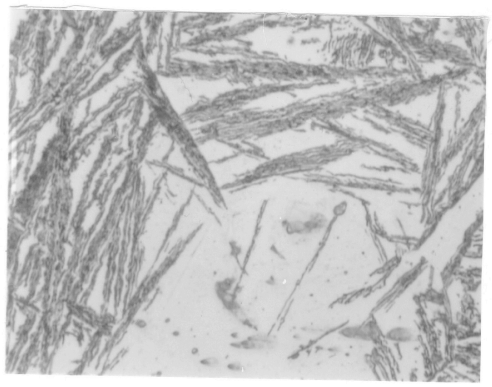

Fig 2: Microstructure of the Material (heat Treated Condition C). Magnification 1000X

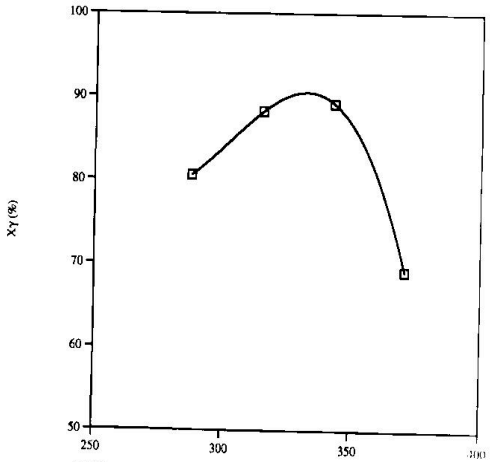

Fig:3 Influence of Austempering Temperature on Volume fraction of Austenite

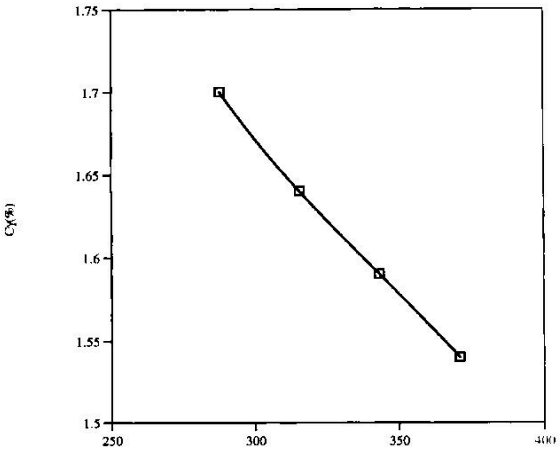

Fig 4: Influence of Austempering Temperature on Carbon Content of Austenite

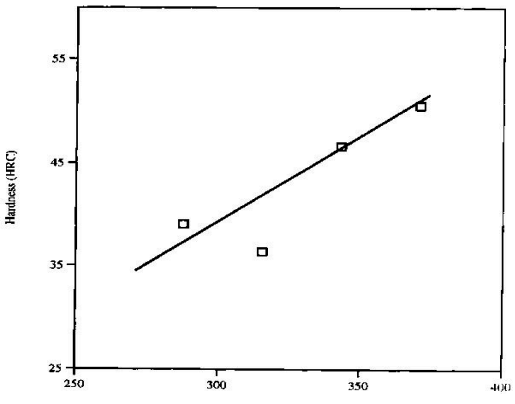

Fig 5: Influence of Austempering Temperature on Hardness

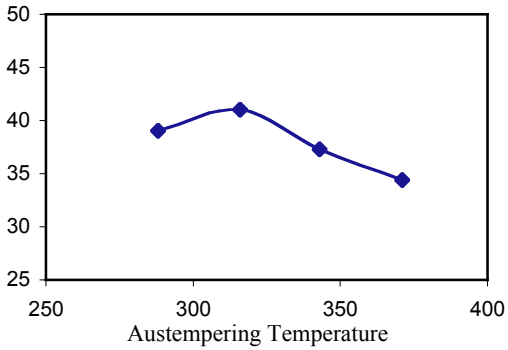

Fig 6: Influence of Austempering Temperature on Fracture Toughness

https://doi.org/10.1017/S1431927603443717 Published online by Cambridge University Press