

ABSTRACT

This thesis describes an investigation on the ductile failure process observed in a low carbon steel in association with a particular strain-rate/temperature regime - a phenomenon called blue brittleness - where the mechanical properties of mild steel show an unusual behaviour, in the form of irregular stress-strain curves which may result from irregular and localised deformation. The equipment for the tensile tests is described. It is observed that the minimum ductility is associated with very low work-hardening characteristics (that is, low m - and n - values). The onset of necking occurs at these low m - and n - values. Voids are observed to be associated mainly with MnS inclusions uniformly distributed in the matrix. These voids grow during the plastic straining of the test-pieces. The growth and coalescence of these voids result in the final fracture. The primary cause of this blue brittleness is the onset of necking at small strains associated with negative strain-rate sensitivity of the flow stress at this particular strain-rate/temperature regime.