

## Abstract

Fatigue behavior and mechanisms of AISI 1015 steel with and without carbonitriding have been studied. The results showed that the carbonitride phases formed around the surface of carbonitrided specimen, and decreased with the increasing depth from surface. The hardness was high at the surface, decreased with the increasing depth from surface, and became stable at approximately 1 mm depth. Under monotonic loading, significant plastic deformation could be observed for AISI 1015 steel (ductile behavior), while only marginal plastic deformation was observed (brittle behavior) for carbonitrided AISI 1015 steel. Fatigue resistance of carbonitrided AISI 1015 steel was better than that of AISI 1015 steel, i.e. the fatigue lives were higher for about an order of magnitude and the fatigue limit was 40 MPa higher. Typical fatigue failure for ductile material was observed on the fracture surface of AISI 1015 steel, while a combination of fracture mode, (a) intergranular fracture with secondary cracks in case material, and (b) ductile fracture with elongated dimples and equiaxed dimples in the core material, were observed on fracture surface of carbonitrided AISI 1015 steel.