Simulation of Binary Nitride Inclusions Effect on Tensile Properties of Steel

Authors : Ali Dalirbod, Peyman Ahmadian

Abstract : Inclusions are unavoidable part of all steels. Non-metallic inclusions have significant effects on mechanical properties of steel. The effects of inclusion on stress concentration around the matrix/inclusion have been extensively studied. The results relating to single inclusion behavior, describe properly the behavior of stress but not the elongation drop. The raised stress in inclusion/matrix results in crack initiation. The influence of binary inclusions on stress concentration around matrix is a major aim of this work which is representative of the simple pattern distribution of non-metallic inclusions. Stress concentration around inclusions in this case depends on parameters like distance between two inclusions (d), angle between centrally linking line of two inclusions, load axis (φ), and rotational angle of inclusion (θ). FEM analysis was applied to investigate the highest and lowest ductility versus varying parameters above. The simulation results show that there is a critical distance between two cubic inclusions in which bigger than the threshold, the stress, and strain field in matrix/inclusions interface converts into individual fields around each inclusion.

Keywords : nitride inclusion, simulation, tensile properties, inclusion-matrix interface

Conference Title : ICMSME 2015 : International Conference on Material Science and Material Engineering

Conference Location : Rome, Italy

Conference Dates : September 17-18, 2015