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IMPROVING THE MECHANICAL PROPERTIES OF HIGH-EFFICIENCY IMPACTING ENERGY ABSORPTION ALLOY BY MODIFICATION OF MICROSTRUCTURES

Abstract

High-efficiency impacting energy absorption (HEIEA) alloy or Twinning induced plasticity (TWIP) steel is a newly developed Fe alloy with extremely high plasticity and impacting energy absorption capacity (IEAC). The excellent properties make it promising candidates in a number of industries including protecting apparatus and buffering mechanics in aero- and space-craft, etc. Relative to its plasticity, however, the strength of the alloy is still not high enough to withstand even large payload or absorb more impacting energies with relatively small mass. To overcome this weakness, studies have been carried out by tailoring the microstructures of the alloy through refining the grains, unidirectional solidification as well as partial plastic working combined with recrystallization of the unidirectionally solidified alloy. It is shown that, by decreasing the grain size from about 35m to 0.7m, the strength of the alloy was increased from about 550MPa to 1360MPa, but the elongation was decreased from 85