

Size Change due to Anisotropic Dilation Behaviour of a Low Alloy SAE 5120 Steel

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A conventional hot rolled, low alloy carburizing steel (C: 0.21 wt.-%; Cr: 1.08 wt.%; Mn: 1.36 wt.%) has been investigated in terms of inhomogeneous phase transformations and anisotropic size changes during heating to austenitizing temperature and during slow cooling from austenitizing temperature to room temperature. A detailed study was executed on dilatometer specimens. The results were compared with the size changes of shafts with similar heat treatment. Ferrite nucleated first at selected chain-like positions and a pronounced ferrite/pearlite rodlike structure was formed. After reaustenitizing the rodlike structure appeared exactly at the same position. At intermediate transformation stages broad regions were still untransformed while other regions had an advanced transformation state. Dilatometer specimens with different orientations to the former rolling direction of the bar had different changes in length, which indicates an anisotropic size change. Cylindrical shafts showed a similar macroscopic size change like the small dilatometer specimens. For the dilatometer specimens as well as for the shafts the absolute values of the size change depended on the initial microstructure.

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