Intermetallics formation during hot dip galvanizing of high carbon steel

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Abstract:

From the moment of immersion, the reaction between molten zinc and solid steel starts forming intermetallic phases. This diffusion-controlled process is largely responsible for the final phase composition of zinc coatings. Several literature sources describe this phenomenon for interstitial free steels, but high-carbon steels are rarely being used as substrates. Therefore, in this work high-carbon steel substrates were used. Multiple samples were created by hot-dipping at various immersion temperatures ranging from 450 to 490 °C and times from 24 to 60 s to investigate mainly the morphology of the obtained intermetallic phase layers. Investigation was carried out mainly by SEM on 20 condition, where several hundred sites were investigated in total to achieve statistically relevant information. It was found that while increasing the immersion time influences mainly the thickness of individual intermetallic phase layers, the temperature influenced mainly their morphology. It was also observed that these results are significantly different compared to ones found in literature for interstitial free steels.

Key words:

Zinc, iron, intermetallic phases, high-carbon steel