

# Analysis of white strip defects in the galvanized coating surface of hot -dip galvanized DP steel

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**Abstract:** The microstructure and characteristics of two types of white stripe defects in hot -dip galvanized DP steel were studied, and the relevant processes were analyzed and discussed. The results show that both types of white strip defects originate from the surface defects of the substrate before galvanizing, and one originates from iron scale of finishing roller, with its microstructure characterized by characteristic elements Mo, V, Cr, Ni, etc; Another type originates from microcracks in the casting slab, whose microscopic characteristics are mainly secondary oxides. Based on the above analysis, the paper clarifies the impact of hot rolling and slab casting processes on white strip defects.

**Key words:** hot -dip galvanneal; dual phase steel; white stripe defects; iron scale of finishing roller; secondary oxides

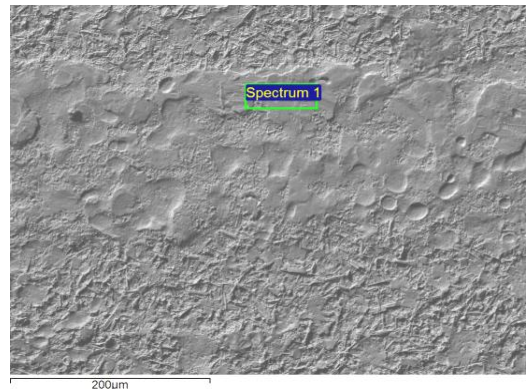
## 1 Introduction

Hot-dip galvanized steel (GA steel) is one of the important product of automotive steel strip, which has excellent corrosion resistance, coating and welding performance, and is widely used in the manufacturing of automotive bodies. Excellent corrosion resistance is the biggest advantage of GA steel. The corrosion resistance of the 7 $\mu$ m-thick galvanized coating is equivalent to 10 $\mu$ m-thick galvanized coating. Dual phase steel (DP steel) generally adopts a combination of solid solution strengthening and phase transformation strengthening by adding alloying elements such as Mn, Cr, Si, Al, etc. Production practice has proven that the addition of these alloy elements has a certain impact on the surface quality of strip steel. This paper investigates two types of white stripe defects on the surface of hot-dip galvanized dual phase steel caused by surface defects on the substrate before galvanizing. The formation process is discussed, and relevant improvement measures are clarified.

We found two types of white strip defects on the surface of hot-dip galvanized dual phase steel. One is a small short strip, and the other is a slender strip (hereinafter referred to as 1 # defect and 2 # defect respectively). Both types of defects exhibit white stripe morphology macroscopically, but their distribution is different. 1 # Defects are densely distributed on the lower surface of the strip steel, the stripe width is 0.1-0.3mm, with length of about 20-30mm, along the rolling direction of the strip steel (Figure 1). 2 # Defects defects are mainly distributed on the upper surface of the strip steel. appearing as white slender strips with a width of 0.1-0.4mm and a length of about 20-60mm, also along the rolling direction of the strip steel (Figure 2). Strip steel with these two types of white strip defects cannot be shipped as qualified products to consumers.

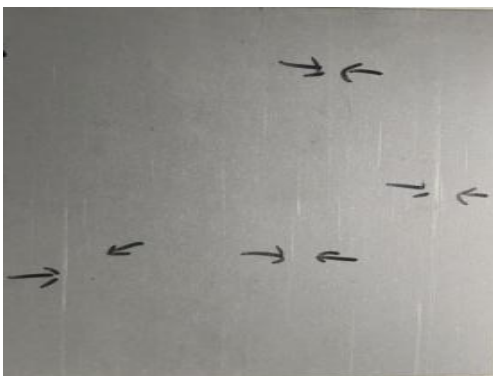


Macroscopic morphology

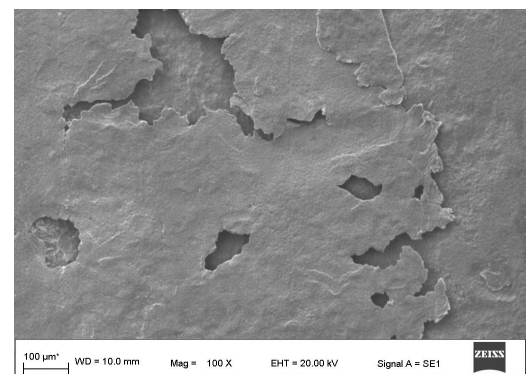


Morphologies morphology

Fig.1 Macroscopic morphology of 1 # defect (small short strip)



Macroscopic morphology



Morphologies morphology

Fig.2 Macroscopic morphology of 2 # defect(slender strip)

The galvanized coating was dissolved from the defect area and surface polishing treatment was performed. SEM morphology observation and energy spectrum analysis were performed. No hot rolling roller components such as Si, Mo, V, Cr, Ni were found, nor were any steelmaking protective slag components found. It can be seen the causes of defect 2 # and defect 1 # are significantly different.

## 5 Conclusion

- (1) The two types of white stripe defects on the surface of hot-dip galvanized dual phase steel are caused by the original surface defects of the substrate.
- (2) The causes of the two types of white stripe defects are different. 1 # defect has a large number of fragments mainly containing Mo, V, Cr, Ni and other components, and no secondary oxide particles. The source of the defect is the hot-rolled oxide scale. Improvement can be achieved through optimizing descaling process.
- (3) 2 # defect is caused by iron oxide and secondary oxides along grain boundaries. The defect is related to cracks in the casting slab. Improvement can be achieved by optimizing the water cooling process of the casting slab and the heating process in the hot rolling heating furnace.