World Scientific Research Journal (WSRJ) ISSN: 2472-3703
www.wsr-j.org

Microstructure Analysis of 304 Stainless Steel Welding

Hongxi Yang [a], Yong Li [b] and Chengbin Li [c]

College of Mechanical and Electronic Engineering, Shandong University of Science and Technology, Qingdao, China

[a]yanghongxi1228@163.com, [b]1176474862@qq.com, [c]1779462429@qq.com

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Abstract: 304 stainless steel is a type of austenitic stainless steel. It has good characteristics of high temperature resistance and oxidation resistance, and has good weld ability. Its welding structure is widely used in life, and it has great effect in the fields of machinery, chemical industry, nuclear power, medical equipment, mechanical meter and so on. The object of this paper is 304 stainless steel plate with a thickness of 6mm. And butt welding joint organization for material analysis, observation and analysis of weld in the crystal morphology, from testing, analyzing the welding section on the hardness, so as to master the characteristics of the joint, and the testing results are analyzed, discussed and summarized.
Keywords: 304 stainless steel; welding structure; performance analysis.

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1. INTRODUCTION

304 stainless steel is a common material in stainless steel. It is a kind of austenitic stainless steel. The steel contains about Cr of about 18%, Ni 8%~25% and C about 0.1%, and has a face centered cubic crystal structure with stable austenite structure. Because austenitic stainless steel contains high chromium, it has good corrosion resistance [1].

Because of the difference in welding technology of rust-steel, the structure composition is also different, and the effect is very different.Therefore, it is necessary to study the corresponding organization in order to achieve the required performance.By studying the various defects can effectively reduce the welding of stainless steel, improve the efficiency of the use of 304 stainless steel and after welding of 304 stainless steel excellent properties, use the excellent performance of 304 stainless steel to avoid effectively the destruction of the other group of yuan to promote the use of 304 stainless steel in our country, give full play to the role of stainless steel in the actual production.

2. MICROSTRUCTURE ANALYSIS OF 304 STAINLESS STEEL WELDING

2.1 Macroscopic sketch map of the weld of the parent material

Fig. 1 shows the macroscopic sketch map of the weld of the parent material, which shows that the front face of the weld has a beautiful appearance, no winding, broken, small holes, splash and depression. The weld is well on the back, the root is well connected, the weld is bright and the surface is not oxidized. Fig. 2 is a macroscopic picture of the welded joint observed under a 50 fold microscope.

Fig 1. Macroscopic sketch map of the weld of the parent material

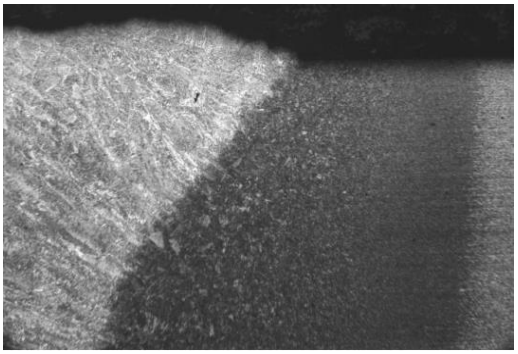

Fig 2. Macroscopically illumination under 50 time's microscope

2.2 Microstructure analysis of welded joint

In this case, a four percent alcohol nitrate solution, which has a corrosive effect, is needed to test the samples that have been obtained and to do a good job of observation and analysis. The morphology of metallographic structure can be observed by optical microscope, and corresponding analysis is made according to the tissue pictures taken from different parts. As shown in Fig. 3, the microstructure of the parent material is composed of black and white lump structures, and the welding heat affected zone is very small. Austenite is the main component of weld phase formation, and the weld microstructure is uniform and fine equiaxed and columnar crystals[8].

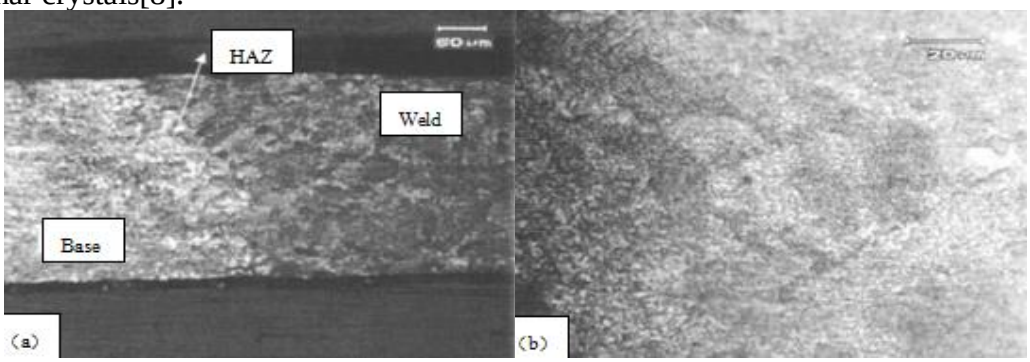

Fig 3. Microstructure of welded joint the whole picture of the organization b) Central microstructure of weld

2.3 Microstructure analysis of fusion zone

The microstructure of the fusion zone is shown in Fig. 4. The fusion zone mainly consists of low temperature stable phase and high temperature stable phase. The structure and structure of the region are very complex. The fusion ratio of metal elements determines the properties of the region, and a certain neutralization phase will be crystallized when the coefficient of fusion ratio is large. The following picture is a picture of the fusion zone of the welded joint.

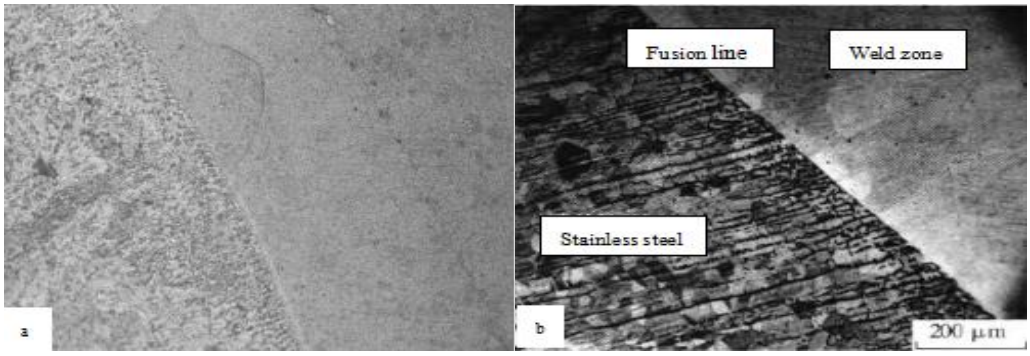

Fig 4. a microstructure of fusion zone b micrograph near the fusion line

It can be seen from the drawing that the phenomenon of recrystallization in the fusion zone is seen. During the welding process, it is formed by the heat generated by the welding. The fine crystal particles are formed by the rupture of the crystal particles of the rectangular shape. The elongated strip is a formed by the crystal particles near the weld zone[9]. After cooling, the columnar crystal particles are formed, which are compact with the base metal and have few defects. The performance of the joint is greatly influenced by the state of the fusion zone, because the carbon and alloy elements spread in the tissue, which leads to the instability of the chemical composition and the instability of the tissue.

3. CONCLUSION

304 stainless steel is a typical austenitic stainless steel. This article first illustrates the status of 304 stainless steel in the whole world of stainless steel, its development prospect and application range. In this paper, 304 stainless steel plates of 6mm were welded by manual arc welding. The welds obtained in this test have good toughness and low brittleness.

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