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# GB

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### Steel Examination by Sulphur Print (Baumann method)

钢的硫印检验方法

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# Steel Examination by Sulphur Print (Baumann method)

## 1 Scope

This Standard stipulates the principle, objective, sample preparation, materials and reagents, test procedure, test safety, test result and test report of steel examination by Sulphur print (Baumann method).

This Standard is applicable to steel, which has more than 0.0050% Sulphur content. It may also be applicable to cast iron.

## 2 Normative References

The following documents are indispensable to the application of this document. In terms of references with a specific date, only versions with the specific date are applicable to this document. In terms of references without a specific date, the latest versions (including all the modification orders) are applicable to this document.

GB/T 8978-1996 *Integrated Wastewater Discharge Standard*

## 3 Principle and Objective

**3.1** Sulphur print test is a qualitative test. It is inappropriate to merely depend on the result of Sulphur print test to estimate steel's Sulphur content.

**3.2** The objective of Sulphur print test is to determine the distribution location of sulfide inclusions in steel through prints on photographic papers, which are previously immersed in acid solution.

**3.3** The precipitation of hydrogen sulfide transforms silver halide of sensitive emulsion into silver sulfide, which becomes black. Thus, Sulphur-concentrated area can be displayed.

**3.4** Through sulfide distribution determined through this method, and the analysis of the amount of sulfide, the degree of steel purity of the part being examined may be estimated. For instance, Sulphur print may display nonuniformity of chemical composition (for example, segregation of free-cutting steel) and defects (such as crack and porosity) on certain forms and structures. In addition, Sulphur print may be adopted to distinguish rimming steel and killed steel; it may also play a role of attracting attention to parts, where the necessity of tests (for example, mechanical property test) or sampling analysis is confirmed.

papers, and the subsequent tests, keep the photographic papers away from strong light exposure.

**6.2** When taking out the photographic papers, use degreasing cotton or absorbent paper to remove redundant diluted acid solution on the photographic papers. The friction between the photographic papers and the examined surface may be increased, so as to avoid blurred images caused by the sliding of the photographic papers. After removing the redundant acid solution, stick the light-sensitive surface of the photographic papers on the examined surface. If the sample is relatively small, the sample may also be placed on photographic papers which are previously immersed. When this method is adopted, please make sure that the photographic papers is tightly attached to the sample and would not trigger any sliding. If necessary, use a heavy object to compress the sample, which will be advantageous to the contact with the photographic papers.

**6.3** If bubbles generated between the photographic papers and the sample surface by mixed air or hydrogen triggered by the reaction cannot be timely eliminated, they will form white spots on Sulphur print images. In order to guarantee favorable contact, rod, scraper or sponge may be used to carefully shift the bubbles out of the edges of the sample. During this process, the photographic papers cannot move.

**6.4** In accordance with the existing documents (for example, chemical composition) of the sample to be tested and the type of defects to be tested, the time of contact may be determined in advance. Generally speaking, the time of contact is 3 min ~ 5 min. The actual contact time should be determined by distinct display of Sulphur print images. When comparing the result of similar samples, conduct standardized treatment of the type, concentration, temperature, immersion time and contact time of acid.

**6.5** Peel off the photographic papers, then, place it into flowing water to rinse for around 10 min. Then, place it into the fixing solution (5.2.2) to immerse for above 10 min. Take it out, place it into flowing water to rinse for over 30 min. During this process, avoid contacting the Sulphur print image area with your fingers. Use clips to fixate the photographic paper on a hanging rope, or, use pins to fixate the photographic paper on a wooden board to let it naturally dry. Photographic paper dryer may also be adopted to quickly dry the photographic paper.

**6.6** Under normal conditions, when the same examined surface needs to be re-examined, re-process it and remove above 0.5 mm. When Sulphur content in steel is more than 0.10%, it may directly enter the second time of Sulphur print test.

## 7 Test Safety

**7.1** The test process will easily generate harmful gas, for example, hydrogen sulfide. Proper ventilation or safeguard measures shall be adopted.

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