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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 10567.2-2007

Replacing GB/T 8000-2001

**Wrought copper and copper alloys - Detection of residual
stress - Ammonia test**

铜及铜合金加工材残余应力检验方法 氨熏试验法

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1 Scope

GB/T 10567.2-2007 is the Chinese national standard on wrought copper and copper alloys - detection of residual stress - ammonia test, in the field of metallurgy. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 25 October 2007 by the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China; Standardization Administration of China, and has been in force since 1 April 2008.

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This standard specifies the method for detecting residual stress (including applied stress) in copper and copper alloy processed materials, by ammonia gas accelerated test. These stresses can cause damage to materials, through stress corrosion cracking, during use or storage. This standard applies to the inspection of the residual stress of brass processed materials. It also applies to the inspection of assemblies and components (limited size).

2 Definitions

2.1 Stress corrosion cracking Spontaneous damage, which is caused by the rupture of a metal, under the combined action of corrosion and residual or applied stress.

2.2 Applied stress Stresses, which are caused and existing inside an object, during the

application of external loads.

2.3 Residual stress Stress, that remains inside an object, as a result of plastic deformation.

3 Principles

Using the principle of strong stress corrosion cracking sensitivity of brass, in an ammonia gas atmosphere, the samples are exposed to the ammonia gas atmosphere for a specified time; then the cracks are examined, under appropriate magnification. negotiation between the supplier and the buyer.

6.3 Before sampling, it shall avoid handling, bumping, or other actions, which may bring in other external stresses, that may affect the test results.

6.4 The specimen shall not have defects, such as bending, flattening, scratching, peeling, wrinkling, bumping and so on. When cutting the specimen, there shall be no applied stress, such as clamping or artificial breaking. Where it is necessary to mark the specimen for easy identification, it shall avoid the introduction of applied stress into the specimen.

7 Test methods and requirements

7.1 The test methods are divided into ammonium chloride test method and ammonia water test method.

7.1.1 When the heat exchangers adopt brass pipes, it can adopt either the ammonium chloride test method or the ammonia water test method. The ammonium chloride test method is used, during arbitration.

7.1.2 The ammonium chloride test method shall be used, for other brass processing materials.

7.2 Ammonia time

7.2.1 The test time of the ammonium chloride test method is 24 h.

7.2.2 The test time of ammonia water test method is 4 h.

7.3 The test temperature shall be 20 °C ~ 30 °C. The temperature fluctuation, during the test, shall not exceed ± 1 °C. During arbitration, the temperature is maintained at 25 °C ± 1 °C.

7.4 Consumption of test solution

7.4.1 The volume of test solution, which is used in the ammonium chloride test method, shall be not less than 20% of the total volume of the container, AND not less than 100 mL per square decimeter of specimen's surface area.

7.4.2 The volume of ammonia water, which is used in the ammonia water test method, is 200 mL.

7.5 The specimen shall be placed in the desiccator, in such a way that the ammonia vapor can freely reach all surfaces of the specimen; meanwhile there shall be no contact between the specimens.

7.6 Specimen cleaning and ammonia fumigation shall be carried out in a fume hood.

8 Test procedures

8.1 Prepare ammonium chloride test solution: Slowly add the sodium hydroxide solution (5.2) into the ammonium chloride solution (5.1.1), to prepare a test solution, which has a specified pH value of ± 0.05 (see Appendix A). Maintain the solution to room temperature. ADD deionized water, to dilute it to a volume of 1000 mL. After dilution, use a pH meter (4.1), to check the pH value.

Note: The preparation of the solution shall be carried out in a fume hood; the solution shall be stored in a mouth-ground bottle (4.2). The pH of the solution shall be checked again, before each use; adjust the solution to the specified pH.

8.2 Use a clean organic solvent or hot alkaline solution (5.3), to degrease the specimen.

8.3 After degreasing, wash the specimen in the pickling solution (5.4). When the concentration of the pickling solution is not enough, add 20 mL ~ 50 mL of hydrogen peroxide solution (5.5), per liter of the pickling solution. Immediately after pickling, rinse thoroughly in running water. Finally use an electric blower (4.5), to blow dry the specimen.

8.4 After the dried specimen has reached the specified test temperature, move it to a desiccator (4.2), at the same temperature.

8.5 When using the ammonium chloride test method, pour the newly prepared test solution (8.1), which has the specified pH value (see Appendix A), into the desiccator. When using the ammonia test method, pour the ammonia water (5.1.2) into the desiccator. Then immediately cover the desiccator lid. Start timekeeping.

8.6 After reaching the specified test time, take out the specimen from the desiccator. First rinse it in the water washing tank (4.6). Then put it into the pickling solution (5.4) for pickling. The pickling time shall be sufficient, that the corrosion products on the specimen surface are sufficiently removed AND the possible cracks can be observed. Finally, use water to wash it thoroughly. Use an electric hair dryer (4.5), to blow dry the specimen.

8.7 Use the magnifying instrument (4.3), to inspect the surface of the specimen for cracks. If necessary, the specimen can be bent slightly, to make small cracks appear, for easier observation. For specimens, which have a diameter of less than