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**Density detecting method for vacuum solidified samples of cast
iron**

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Foreword

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Semi-Solid State Technology Research Institute Co., Ltd., Guangdong Hongtuo Instrument Technology Co., Ltd. Main drafters of this document: Zhao Zhongxing, Zhang Xianfei, Liu Fengguo, Lu Shiping, Zhong Gu, Zhang Feng, Zhang Jianliang, Yang Zhaoling, Yan Feng, Bai Bangwei, Ye Zhen, Liang Xin, Li Zhaohua, Huo Huijuan, Sun Fangfang, Zhu Jiahui, Wu Yuying, Hu Zhongchao, Li Weirong, Cai Hengzhi, Hou Wei, Dong Zhen, Gao Zhongyu, Sun Dashu, Yu Zhongjun, Yan Shengyuan, Lu Chenming, Liu Qinshuang, Yang Jie, Song Wei, Li Dongyu, Sun Pu, Zheng Lijun, Sun Ju, Zhang Chunming, Lin Guodong, Zhong Conggang, Pan Shuguang. Density detecting method for vacuum solidified samples of casting aluminum alloys liquid WARNING -- Personnel using this document shall have practical experience in formal laboratory or smelting site work. This document does not identify all possible security issues. Users are responsible for taking appropriate safety and health measures and ensuring compliance with relevant national regulations.

1 Scope

China's national method for detecting the density of vacuum-solidified cast iron samples. The technique is a foundry control test with a specific purpose: assessing the nodularity of ductile iron before the metal is poured. A sample of the treated melt is solidified under vacuum, which exaggerates the effect of the dissolved gas and of the graphite morphology on the volume change during solidification. Well-nodularised iron with adequate carbon expands as its graphite forms and gives a dense, sound sample; poorly treated iron shrinks and gives a lower density. The measurement therefore predicts, within minutes and before any castings are made, whether the magnesium treatment worked - which is the question that decides whether a ladle is poured or re-treated. Getting it wrong means a batch of castings that look normal and are grey iron rather than ductile, discovered only when they are tested or when they break.

This document specifies the principle, test conditions, test equipment, sample preparation requirements, test steps, precision and test reports for density detecting of vacuum solidified samples of casting aluminum alloy liquid. This document is suitable for rapid density detecting for vacuum solidified samples of casting aluminum alloy liquid.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 5611, Foundry terminology

3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 5611 apply.

4 Principle

The method for detecting the density of vacuum solidified samples of casting aluminum alloy liquid (hereinafter referred to as "vacuum solidified samples") is: Based on the law of buoyancy (Archimedes' law), the volume of the vacuum solidified sample is obtained by weighing it completely immersed in water; the density value of the vacuum solidified sample is obtained through the density relationship. a preheated pouring spoon to take out the aluminum alloy liquid below 10 cm from the surface of the aluminum alloy liquid. Pour aluminum alloy liquid into the crucible. The amount of aluminum alloy liquid poured is less than 80% of the height in the crucible. The crucible shall not be filled to the brim so that the vacuum solidified sample can be removed under reduced pressure;

c) After the pouring of the vacuum solidified sample is completed, cover the vacuum tank. Start the vacuum system. The time relay starts timing. Make the vacuum degree of the vacuum chamber reach a sample preparation vacuum degree between -

0.092 MPa~-

0.099 MPa within 15 s. During this period, the aluminum alloy liquid in the crucible does not solidify;

d) Observe the gas generation during the solidification process of the aluminum alloy liquid through the glass window above the vacuum tank. For aluminum alloy liquids with a large gas content, a large number of bubbles can be observed to precipitate from the aluminum alloy liquid;

e) After the vacuum solidified sample is solidified, take the vacuum solidified sample out of the crucible and weigh it;

f) When weighing, first place the vacuum solidified sample frame in the container. Turn on the electronic scale switch so that the indication is zero. If the indication is not zero, press the "Tare" key to make the indication zero. Place the vacuum solidified sample above the electronic scale and weigh its mass in air, as shown in Figure 4. After the black dot in the lower left corner of the screen disappears, gently press the "Mode" key. It is displayed on the panel as shown in Figure 5.

8.1.2 Place the vacuum solidified sample in the material frame in the container below the electronic scale (make sure that the vacuum solidified sample is completely immersed in water). Weigh the mass in water. After the black dot in the lower left corner of the screen disappears, gently press the "Mode" key. Displays the density value in the panel. NOTE: Refer to Annex A and Annex B for the corresponding relationship between the density value measured in the test and the pinhole degree and low-magnification structure of aluminum alloy.

9 Precision

Use the following provisions to judge the validity of the results.

- a) Repeatability: The same operator performs repeated measurements on the same vacuum solidified sample on the same instrument. The relative standard deviation of the two test results shall not exceed 2%. It is based on the premise that the case that it is greater than 2% of the relative standard deviation value of the two test results shall not exceed 5%.
- b) Reproducibility: Different operators conduct measurements on the same vacuum solidified sample in different laboratories. The relative standard deviation value of the two test results shall not exceed 4%. It is based on the premise that the case that it is greater than 4% of the relative standard deviation value of the two test results shall not exceed 5%.

10 Test report

The test report shall include but not be limited to the following: