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

GB/T 24533-2019

Replacing GB/T 24533-2009

Graphite negative electrode materials for lithium-ion batteries

锂离子电池石墨类负极材料

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009. This standard replaces GB/T 24533-2009 "Graphite negative electrode materials for lithium ion battery". As compared with GB/T 24533-2009, the main technical contents of this standard are as follows: - MODIFY the normative references (see Chapter 2); - MODIFY the definition of graphite negative electrode material for lithium ion battery; MODIFY the "carbon anode" in the definition into "graphite anode" (see 3.1); - MODIFY the "mesophase carbon microsphere artificial graphite" into "carbon micro bead"; MODIFY the "petroleum coke type artificial graphite" into "common petroleum coke artificial graphite"; ADD the explanation of composite graphite (see 4.1.1); - MODIFY the grade of graphite anode materials for some lithium-ion batteries; ADD the graphitization index (see 4.1.2); - DELETE the "AG-PAG-I-18-340" from the example of product code (see

4.2 of 2009 edition); - MODIFY the content of typical product technical indicators; MODIFY the "Table 3 ~ Table 11" to "Table 3, Table 4, Table 5" (see 5.2); - MODIFY the moisture determination into making determination according to Appendix B or GB/T 3521 (see 6.3); - MODIFY the determination of specific surface area into making determination according to GB/T 19587 (see 6.6); - ADD the determination method of the graphite orientation (reference index), to make determination according to the provisions of Appendix F (see 6.9); - DELETE the determination of NO₂- and PO₄³⁻ (see

6.12 of the 2009 edition); - MODIFY the method for determination of organic content (see 6.17); - MODIFY the method for determination of the content of restricted substances (see 6.18); - MODIFY the sampling and sample preparation into complying with the provisions of GB/T 1427 (see 7.1.1); - DELETE that "samples that are used for inspection and retention shall be retained for at least 500 g" (see version

7.1.4 of 2009); - In the exit-factory inspection, ADD the first discharge specific capacity, the first coulombic efficiency; DELETE the pH value (see 7.2.1); - DELETE the "raw material batch number" in the type test (see

7.2.2 of the 2009 edition); - In the acceptance rules, DELETE that "the receiving party has the right to accept the product according to this standard and has the right to reject products that do not meet the requirements of this standard" (see

7.3.3 of the 2009 edition); - MODIFY the requirements for packaging and marking. the packaging and marking of the product conform to the provisions of GB/T 191 and GB/T 6388; the net weight is negotiated between the supplier and the purchaser (see 8.1); - DELETE "Recommendation. in an environment with temperature $\leq 45^{\circ}\text{C}$ and humidity $\leq 75\%$ " (see

8.2 of 2009 edition); - DELETE that "At the front side of each package of the graphite negative electrode material for lithium-ion battery, it shall have a prominent mark" (see

8.4.1 of 2009 edition); - DELETE the "Recommendations. temperature $\leq 45^{\circ}\text{C}$ and humidity $\leq 75\%$ " (see

9.1 of 2009 edition); - MODIFY the requirements for dispersant in Appendix A (see A.3.1); - MODIFY the scope of the particle test (see A.4.3); - MODIFY the instrument setting parameters in Appendix A to. Set the optimal parameters according to the instrument manual (see A.4.4); - MODIFY the results calculation and data processing in Appendix A, adding "Dmax" (see A.7); - MODIFY the instrument and equipment in Appendix B; MODIFY the balance sensitivity to "0.0001 g"; INCREASE the micro-injector by "5 μL " (see B.4.2 and B.4.3); - MODIFY the reagents and materials in Appendix C (see C.3); - MODIFY the instruments and equipment in Appendix C; DELETE the watch glass and the hot plate; ADD the ultrasonic cleaner (see C.4); - MODIFY the preparation of specimen in Appendix C (see C.5); - MODIFY the instruments and equipment in Appendix D; MODIFY the balance sensitivity to "0.0001 g" (see D.4.4); - ADD the requirements for rounding off of the result calculation and data processing in Appendix D (see D.6.3); - ADD the Appendix F, Determination of graphite orientation (see Appendix F); - MODIFY the binder in Appendix G (see G.3.2); - MODIFY the analysis procedure in Appendix G; MODIFY it into "charge-discharge rate of 0.1C" (see G.6); - MODIFY the scope of Appendix H and ADD the "cobalt, zinc" (see H.1); - MODIFY the reagents and materials in Appendix H; ADD the standard solutions of cobalt and zinc (see H.3); - MODIFY the instruments and equipment in Appendix H; MODIFY the balance sensitivity to "0.0001 g" (see H.4); - MODIFY the

determination requirements in Appendix H; ADD the reference wavelengths of cobalt and zinc (see H.7); - DELETE the "NO₂-" and "PO₄₃-" from the scope of Appendix I (see I.1 of the 2009 edition); - DELETE the preparation of the standard solution of "NO₂-" and "PO₄₃-" from the reagents and materials in Appendix I (see I.3 of 2009 edition); - MODIFY the determination range in Appendix K; ADD the cobalt content (see K.1); - MODIFY the reagents and materials in Appendix K; ADD the cobalt standard solution (see K.3.5); - MODIFY the instruments and equipment in Appendix K (see K.4); - MODIFY the specimen preparation in Appendix K (see K.5); - MODIFY the preparation of a series of mixed standard solutions in Appendix K (see K.6); - MODIFY the analytical procedures in Appendix K (see K.7); - MODIFY the reagents and materials in Appendix L; ADD the absolute ethanol (see L.3.2); - MODIFY the instruments and equipment in Appendix L; USE the digital thickness gauge to replace the Vernier caliper (see L.4.3); - MODIFY the analytical procedures in Appendix L (see L.5); - MODIFY the results calculation and data processing in Appendix L (see L.6); - MODIFY the sensitivity of the electronic balance in instruments and equipment in Appendix M to "0.0001 g" (see M.3.1); - In Appendix M, DELETE that the "25 cm³ measuring cylinder is mainly used to measure powders with a bulk density of more than 4 g/cm³" (see M.3.2.2 of the 2009 edition); - MODIFY the Table of bulk density and powder amount in the analytical procedures of Appendix M (see M.4.2); - DELETE the original Appendix D, Appendix N, Appendix O (see 2009 edition). This standard was proposed by the China Iron and Steel Association. This standard shall be under the jurisdiction of the National Steel Standardization Technical Committee (SAC/TC 183). Drafting organizations of this standard. Shenzhen Beiterui New Energy Materials Co., Ltd., Guangdong Dongdao New Energy Co., Ltd., Beiterui (Jiangsu) New Materials Technology Co., Ltd., Huizhou Beiterui New Material Technology Co., Ltd., Shanxi Beiterui New Energy Technology Co., Ltd., Tianjin Beiterui New Energy Materials Co., Ltd., Metallurgical Industry Information Standards Institute. The main drafters of this standard. He Xueqin, Chen Nanmin, Zhou Haihui, Yue Min, Huang Youyuan, Ren Jianguo, Zheng Jingxu, Wu Qixiu, Yan Huiqing, Wang Hongjing, Xiao Wei, Zhou Chengkun, Zhang Qinglai, Mao Aiping, Zhou Huijian, Zheng Haichi, Zhang Jinying, Miao Yanli, Li Shoubin, Wang Peichu, Geng Linhua, Zhou Haomao. This standard replaces the standard previously issued as follows: - GB/T 24533-2009. Graphite negative electrode materials for lithium ion battery

1 Scope

China's national product standard for the graphite anode materials of lithium-ion batteries. It specifies the classification, the requirements, the test methods, the inspection rules and the marking, packaging, transport and storage of graphite negative electrode materials. Graphite is the anode of essentially every lithium-ion cell made, and it holds that position because of a structural accident: its layers are far enough apart for lithium ions to intercalate between them, at a potential close to that of lithium metal but safely above it, reversibly, for thousands of cycles. Nothing else combines that with the cost of a material

made from petroleum coke or mined as flake. The standard covers both the natural and the synthetic forms, which are different products: natural graphite is cheaper and has higher capacity but a surface that reacts with electrolyte and a flake shape that orients during coating and hinders ion transport; synthetic graphite costs more and gives lower capacity but far better cycle life and rate capability, which is why power and automotive cells use it. The requirements are those that decide cell performance. The specific capacity and the first-cycle efficiency, because the lithium lost forming the passivating layer on the anode comes out of the cathode and is gone permanently. The particle size distribution and the specific surface area, which govern both the rate capability and how much surface there is for that irreversible reaction. The tap and compacted density, which set the electrode density and therefore the energy per litre. The ash and the magnetic impurities, measured in parts per billion, because a metallic particle in an anode can dissolve and plate through the separator and short the cell. And the moisture, since water in a lithium cell generates hydrofluoric acid. Issued on 25 March 2019 and in force since 1 February 2020, it replaces GB/T 24533-2009.

This standard specifies the terms and definitions, classification and code, technical requirements, test methods and inspection rules for graphite negative electrode materials for lithium ion battery. This standard applies to graphite-based negative electrode materials used as negative electrodes for lithium ion batteries.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this standard.

GB/T 191 Packaging - Pictorial marking for handling of goods

GB/T 1427 Sampling method for carbon material GB/T 3120 Nickel wire

GB/T 3521 Method for chemical analysis of graphite

GB/T 3782 Acetylene black GB/T 4369 Lithium

GB/T 5187 Foil of copper and copper alloy

GB/T 6388 Sign for transport packaging receipt and delivery

GB/T 6682 Water for analytical laboratory use - Specification and test methods

GB/T 8170 Rules of rounding off for numerical values & expression and judgement of limiting values

GB/T 9724 Chemical reagent - General rule for the determination of pH