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**Technical specifications for solid electrolyte for solid-state
battery for electric vehicle**

电动汽车固态电池用固体电解质技术规范

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1 Scope

This document specifies the requirements on the ionic conductivity, the electronic conductivity, the electrochemical window, the air stability and the water content of solid

electrolyte films for solid-state batteries for electric vehicles, and describes the corresponding test methods.

This document applies to polymer-based solid electrolyte films and sulfide-based solid electrolyte films used in solid-state batteries for electric vehicles; solid electrolyte films of other types may use it for reference.

2 Normative references

The following documents contain provisions which, through normative reference in this text, constitute indispensable provisions of this document. For dated references, only the edition cited applies. For undated references, the latest edition, including any amendments, applies.

GB/T 6283, Determination of water in chemical products - Karl Fischer method (general method)

GB/T 45330-2025, Cathode materials for lithium ion batteries - Determination of water content - Karl Fischer coulometric method

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 blocking electrode - an electrode able to block the passage of a particular charge carrier, electron or ion. Note: blocking electrodes fall mainly into two classes: electron-blocking electrodes, which block electrons and conduct ions, and ion-blocking electrodes, which block ions and conduct electrons.

3.2 oxidation potential - the physical quantity at which an oxidation reaction, the loss of electrons, takes place at a given potential. Note: the unit of oxidation potential is the volt (V).

3.3 reduction potential - the physical quantity at which a reduction reaction, the gain of electrons, takes place at a given potential. Note: the unit of reduction potential is the volt (V).

3.4 air stability - the retention of the ionic conductivity of a solid electrolyte film before and after exposure to an air environment.

3.5 water content - the mass fraction of water in the solid electrolyte film.

3.6 polymer-based solid electrolyte - a solid electrolyte in which the mass fraction of polymer solid electrolyte is not less than 50 %.

3.7 sulfide-based solid electrolyte - a solid electrolyte in which the mass fraction of sulfide solid electrolyte is not less than 50 %.

4 Requirements

4.1 Ionic conductivity. The ionic conductivity of the solid electrolyte film is tested according to 6.1; it shall be not less than 1.0×10^{-3} S/cm.

4.2 Electronic conductivity. The electronic conductivity of the solid electrolyte film is tested according to 6.2; it shall be not greater than 1.0×10^{-9} S/cm.

4.3 Electrochemical stability window. The electrochemical stability window of the solid electrolyte film is tested according to 6.3; the oxidation potential in the electrochemical window shall be not lower than 4.5 V and the reduction potential not higher than 1.5 V.

4.4 Air stability. The air stability test is carried out according to 6.4; the air stability of the solid electrolyte film shall be not less than 80 %.

4.5 Water content. The water content is determined according to 6.5; the water content of the solid electrolyte film shall be not greater than 0.03 %.

5 Test conditions

5.1 Environmental conditions. Unless otherwise specified, each test shall be carried out under the following environmental conditions: temperature 25 degrees C plus or minus 2 degrees C; dew point -45 degrees C to -40 degrees C (where a coin cell is used for the test, the test environment is not restricted to this dew point range); air pressure 86 kPa to 106 kPa. A solid electrolyte film containing air-sensitive materials such as sulfides or halides should be tested in a glove box in which the water and oxygen content can be controlled, with a water content below 0.1 mL/m³ and an oxygen content below 0.1 mL/m³ during the test.

5.2 General test conditions. The general test conditions include the following. Apart from the water content test, where a pressure die is needed in the other test items the pressure die of Annex A should be used. The test device should be chosen to suit the pressure characteristics of the solid electrolyte film: a pressure die should be used for a sulfide-based solid electrolyte, while the manufacturer of a polymer-based solid electrolyte may choose a coin cell or a pressure die according to the composition and characteristics of the material. Where a forming pressure has to be applied during the test, the pressure parameters used in the production and preparation of solid-state batteries may be taken as a reference.

5.3 Accuracy of instruments and meters. The accuracy of the instruments and meters shall be not lower than the following: mass measuring device plus or minus 0.1 % FS; dimension measuring device plus or minus 0.1 % FS; pressure-applying device plus or minus 2 % FS; temperature measuring device plus or minus 1 degree C; humidity measuring device plus or minus 2 % relative humidity; voltage measuring device plus or minus 0.5 % FS; current measuring device plus or minus 0.5 % FS; time measuring device plus or minus 0.1 s.

6 Test methods

6.1 Ionic conductivity. The ionic conductivity of the solid electrolyte film is tested according to Annex B.

6.2 Electronic conductivity. The electronic conductivity of the solid electrolyte film is tested according to Annex C.

6.3 Electrochemical stability window. The electrochemical stability window of the solid electrolyte film is tested according to Annex D.

6.4 Air stability. The air stability test is carried out according to Annex E.

6.5 Water content. The water content is determined according to Annex F.