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**Defect analysis methods for battery electric vehicles fire
accidents**

纯电动汽车火灾缺陷分析方法

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Foreword

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1 Scope

GB/T 45415-2025 is the Chinese method for analysing fires in battery electric vehicles and deciding whether a safety defect caused them. It is a document that did not need to exist ten years ago, and it exists now because an electric vehicle fire is different in kind from a petrol one: it can start without an ignition source, it can start hours after the vehicle stopped, it reignites, and the evidence is largely destroyed by the event itself. The standard sets out the collection and preservation of evidence from a burnt vehicle, the identification of the origin of the fire within the battery pack or elsewhere in the vehicle, the examination of the cells, the modules, the battery management system, the charging interface and the high voltage circuits, the analysis of the vehicle and charging data, and the reasoning that separates a cell defect, a manufacturing defect, a design defect, external damage and

misuse. For a manufacturer, a battery supplier, an insurer or a regulator dealing with an EV fire in China, this is the analytical framework.

This document establishes the analysis procedure for defect analysis of battery electric vehicle fire accidents, and describes the in-depth analysis method for battery electric vehicle fire accident information, batch vehicle information analysis method, defect engineering analysis and test method, defect identification and judgment, and defect analysis report content. This document applies to the defect analysis of battery electric vehicle fire accidents. It is used as a reference for the defect analysis of other types of electric vehicle fire accidents.

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 5907.1 Fire protection vocabulary - Part

3 Terms and definitions

For the purpose of this document, the terms and definitions defined in GB/T 5907.1, GB/T 19596, GB 38031, GB/T 43387 and GB/T 43388 and the following apply.

6 In-depth analysis of fire accident information

6.1 General Based on the on-site investigation of one or more fire accidents of battery electric vehicles of the same model and batch, collect basic information on battery electric vehicle fire accidents, accident vehicle data information, accident scene investigation information, accident evidence analysis information and other relevant information, comprehensively analyze the fault mode, and identify the fire failure cause.

6.2 Fire accident information collection

6.2.1 Basic accident information Basic accident information generally includes but is not limited to. - accident information. accident time, accident location, accident vehicle status and driving conditions, accident vehicle power, casualties, accident vehicle storage location, accident scene video, etc.; - accident process information. information of processes such as vehicle fire accident occurrence, discovery, firefighting; - accident disposal information. storage, towing and disposal of accident vehicles after fire extinguishing, etc.; - fire investigation information. information obtained through investigation in accordance with the requirements of XF/T 812, such as other traffic accidents that occurred before the fire accident, chassis collision, wading, soaking in water, battery replacement or repair, vehicle modification and installation, etc., preliminary analysis and judgment of the cause of the fire

accident, etc.; - accident vehicle dealer information. dealer registration name, contact number, mailing address, accident vehicle sales date, etc.

6.2.2 Accident vehicle data information Accident vehicle data information generally includes but is not limited to. - accident vehicle information. electrical system layout of the accident vehicle, power battery layout, maintenance record of the accident vehicle, vehicle operation data and operation cycle data 7 days before the accident, etc.; - accident vehicle operation cycle data analysis information. analysis of vehicle usage such as fast charging ratio, maximum charging current, daily mileage, total mileage, insulation changes, historical alarm information, battery abuse, etc. of the accident vehicle, as well as safety parameter correlation analysis, consistency analysis, etc.; - accident vehicle power battery information. location, manufacturer, nominal total capacity, nominal total voltage, total weight, charging power, system thermal management form, series-parallel type, number and layout of voltage and temperature sensors of the power battery; manufacturer, specification and model, nominal capacity, cell weight, maximum sustainable charge and discharge power, maximum sustainable charge and discharge current, battery electrochemical system, positive electrode material type of the battery cell; module location, module manufacturer, software manufacturer, hardware manufacturer, etc. of the battery management system.

6.2.3 Accident scene investigation information Accident scene investigation information generally includes but is not limited to. - accident data pre-analysis information. safety parameter correlation analysis of vehicle operating total voltage, total current, battery temperature, insulation resistance, and background monitoring fault information 7 days before the accident, as well as parameter consistency analysis of battery cell voltage, temperature probe monitoring value, etc.; - accident investigation information. analysis of burn damage and residual traces of accident vehicle body, power compartment, trunk, chassis, passenger compartment, main parts such as battery, motor, electronic control, and charging socket, data analysis of charging piles of accident vehicles in charging state, fire spread trend and fire location judgment, etc.; - accident vehicle fault mode and accident cause analysis information. accident vehicle fault mode identification process, fire cause.

6.2.4 Accident evidence analysis information Accident evidence analysis information generally includes but is not limited to. - electrical short circuit trace analysis information. analysis of melting marks caused by vehicle high-voltage wiring harness, low-voltage wiring harness and its connectors, and analysis of melting marks of charging piles and wiring harnesses; - fire trace analysis information. analysis of melting marks caused by fire on vehicle wiring harnesses, plastic parts, etc.; - battery pack burn analysis information. analysis of battery pack shell, battery pack internal parts and wiring harness burn conditions, analysis of mechanical deformation and arcing of structural parts, modules or cells in battery packs, production date, vehicle registration date, vehicle nature, vehicle category, power type, chassis type; production and manufacturing data, operation cycle data, fault and maintenance information of some vehicles; - power battery information. battery cell supplier, module supplier, battery pack supplier, battery management system