VRIJE UNIVERSITEIT BRUSSEL

The faculty of Engineering of the Vrije Universiteit Brussel invites you to attend the public defense leading to the degree of

DOCTOR OF ENGINEERING SCIENCES

of **Jiacheng He**

The public defense will take place on **Thursday 5th June 2025 at 4pm** in room **D.2.01** (Building D, VUB Main Campus)

To join the digital defense, please click here

THERMAL CHARACTERISATION OF LITHIUM-ION BATTERIES AND OPTIMISED CONTROL STRATEGIES IN ELECTRIC VEHICLES

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Abstract of the PhD research

Lithium-ion batteries, widely used in electric vehicles, generate heat during both charging and operation. Without effective thermal management, increased operating temperatures can impair battery performance, accelerate ageing, and potentially lead to safety risks. This research addresses these challenges by improving the thermal characterization and control of battery systems.

In this study, first, a low-cost and accessible method was developed to estimate the specific heat capacity of batteries—a fundamental thermal property—using standard laboratory tools. Then, based on this information, thermal models were developed to simulate battery behavior under various conditions. Using these models, optimisation algorithms were designed to improve battery preheating and fast charging, leading to better energy efficiency, reduced charging time, and improved thermal safety. In summary, these works contribute to safer, more efficient, and more robust use of lithium-ion batteries in electric vehicle applications.