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Development of BEV Battery Pack and Key Technologies Utilizing Advanced Steel Sheets (First Report)

- Development of the key technologies to achieve high performance, process reduction, and space savings -

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This study proposes a steel-based battery pack concept for battery electric vehicles (BEVs) using advanced high-performance steel sheets to achieve high safety, cost efficiency, and environmental performance. The battery pack is a critical structural component that strongly influences vehicle safety and durability.

A newly designed steel battery box structure was developed by optimizing structural layouts and material selection (Figure 1). Ultra-high-strength steel sheets, including 2.0 GPa-class hot-stamped steel and 980 MPa-class energy-absorbing steel, were applied to improve crashworthiness within limited packaging space. Numerical simulations confirmed that the structure satisfies target crash loads and achieves a lowest global natural frequency above 50 Hz, reducing the risk of resonance and fatigue.

The feasibility of reducing electrodeposition coating was also investigated by applying high-corrosion-resistant Zn–Al–Mg coated steel sheets (Figure 2). Corrosion tests demonstrated excellent resistance to red rust even after surface damage, indicating potential environmental and cost benefits.

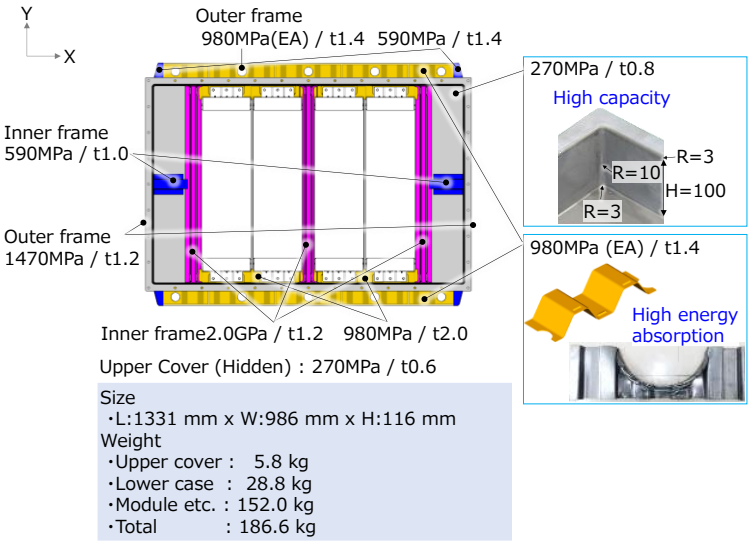

Fig.1 Structure of the steel battery box

In addition, a two-step bending forming method was developed to realize small inner bend radii in high-strength steel components, improving internal space efficiency of battery packs. (Figure 3)

These results demonstrate that steel-based battery box structures offer a competitive solution for next-generation BEVs.

Fig.2 Prototype of the upper cover made of Zn-Al-Mg coated steel sheet

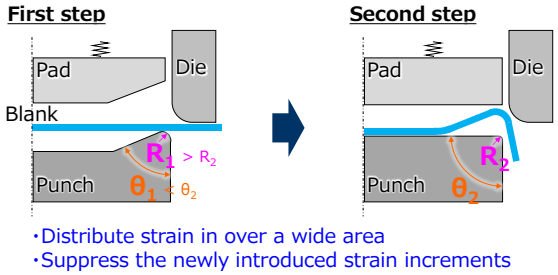

Fig.3 Concept of bending method for strain dispersion