

FOOD DELIVERY & PACKAGING

Food Packaging & Delivery Thermal Solution

Embedded CNT heating for insulated delivery boxes and rapid-heating single-use food containers.

- Constant-temperature delivery box driven from 5 V scooter power
- Complete smart-heat kit at ¥100 per set
- Single-use container: $\leq$ ¥4.5 per unit, 60 °C within one minute

FlexTherm · Shanghai Burning New Material Co., Ltd.

Technical & Commercial Solution Brief · FOOD-EN-1.0 · English Edition

01 CORE MATERIAL

Carbon Nanotube Heating Film

CNT heating film is a self-assembled network structure formed from freely arranged carbon nanotube arrays. It combines excellent mechanical, electrical and thermal performance with high chemical stability, and is one of the most promising energy-saving heating materials available for industrial adoption today.

99.5%**Electro-thermal conversion**

Electrical energy converted into usable heat

1.35 g/cm³**Ultra-low film density**

Average film thickness of only 5 μm

3500 W/m·K**Thermal conductivity**

Very low heat capacity: instant on, instant off

0.89**Normal total emissivity**

Strong far-infrared radiation characteristics

60%+**Thermal radiation ratio**

Higher usable heat output per watt

±1 °C**Temperature accuracy**

NTC sensing plus proprietary control algorithm

Surface heating, not line heating

Conventional resistance wire heats along a line, producing hot spots and cold gaps. CNT film heats across its entire surface, so heat distribution is even, controllable and repeatable across large or irregular areas.

02 SYSTEM ARCHITECTURE

CNT Flexible Thermal Management System

Encapsulation fabric > CNT heating film > FPC circuit > NTC sensor > Encapsulation fabric

Ultra-thin and fully flexible The extremely high aspect ratio of carbon nanotubes forms a self-assembling film network. It can be bent, folded and crumpled freely, solving the poor flexibility and poor surface contact of conventional heating pads.	Fast, even heating Surface temperature rises to the set point within seconds. The film emits far-infrared radiation in the 6–14 μm band, which penetrates directly into the target medium rather than only warming its surface.
Safe by design Powered from 3.7 V / 5 V / 7.4 V / 12 V / 24 V low-voltage inputs, far below the 36 V human safety limit. Multi-layer protection covers over-current, short circuit and open circuit.	Intelligent temperature control In-house hardware and control-algorithm development enables multi-level precision control, with heating profiles tuned to each customer's temperature and timing requirements.
Machine washable The film's resistance to repeated folding supports 40 standard wash cycles. FlexTherm heating assemblies carry a high waterproof rating and retain full performance after washing.	Instant heat-up, precise holding Sheet resistance is very low and extremely uniform, so heat-up is immediate at minimal power draw. Patch NTC sensors bonded to the film deliver ±1 °C control accuracy.

Verified heat-up curve

With the highest level set to 53 °C, surface temperature exceeds 55 °C within one minute, then enters holding mode and stabilises at approximately 53 °C. The difference between the two measurement points stays within 1 °C.

03 MARKET SITUATION

Where Insulated Delivery Boxes Fall Short

Delivery boxes in service today are built from mesh-laminated fabric, EPE pearl cotton and woven aluminium foil. These materials provide a degree of insulation, but their performance in winter is poor: once the cold season starts, complaints that “the food isn't hot any more” rise sharply and platform compensation payouts increase with them.

A shared pain point for four parties

Food delivery is unusual in that both time and space keep changing. A single order is packed at the store, collected and carried by the rider, and finally handed to the customer. Keeping the meal in good condition throughout that journey is the single point that customers, riders, merchants and platforms all care about most.

Winter is the critical season

In winter, “hot” dominates every delivery category. Mala soup, soup noodles, steak and stews are exactly the categories that sell most in cold weather — and exactly the ones that cannot tolerate going cold. (Reference: Meituan Qingshan Plan — Green Packaging Solutions for Food Delivery.)

04 SOLUTION

“Smart Heat” Delivery Box

The CNT heating film — a light, thin, sheet-form heating material with instant temperature response — is embedded inside the delivery box. Warm air circulates and the food is held at a constant temperature for the whole journey.

Element	Specification
Heating layer	CNT film embedded into the inner wall of the insulated box.
Power input	USB interface, or direct supply from the rider's electric scooter.
Drive voltage	5 V only — safe, low-voltage operation.
Effect	Heat circulation keeps food at a constant temperature rather than merely slowing heat loss.

Full smart-heat kit

¥100 / set

Complete kit price

Leg cover + gloves + insulated box heating film

5 V

Scooter power

Powered directly from the delivery scooter

4 parties

Benefit

Customer, rider, merchant and platform

05 SUSTAINABILITY & PRODUCTS

Supporting Green Packaging Programmes

- Adding heating to the delivery box removes the need to develop dedicated heat-retaining meal packaging, cutting both development time and cost at the root.
- Platform-level green packaging programmes become easier for merchants to accept, so rollout across categories can move quickly.
- Merchants reduce packaging cost, striking a balance between customer experience and environmental impact.
- In bad weather, when delivery times stretch unpredictably, a continuously heated box protects the interests of both rider and customer.

Rapid-heating single-use food container technology

≤ ¥4.5 / unit Total cost Per single-use rapid-heating container	60 °C in 1 min Target performance Heat-up target for the container	2 categories Applications Delivery meal boxes; self-heating convenience food
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Safety regulations and export qualifications

Certificate	Scope
RoHS (English certificate)	CNT flexible heating film — restricted substances compliance.
Electrical safety report	CNT flexible heating film — electrical safety test report.
CE certificate	CNT flexible heating film — European conformity.

NEXT STEP

Build It With FlexTherm

FlexTherm develops and manufactures carbon nanotube flexible heating systems for brands, OEM and ODM programmes worldwide. Every solution in this document can be tailored to your geometry, voltage, temperature profile, control logic and certification requirements.

Custom development Heating film layout, flexible electrodes, NTC control board and firmware developed to your specification.	Compliance support RoHS, CE and electrical safety documentation prepared for your target market.
Sampling & scale-up Prototype samples first, then validated tooling and mass production.	Talk to us Shanghai Burning New Material Co., Ltd. — FlexTherm carbon nanotube heating systems.