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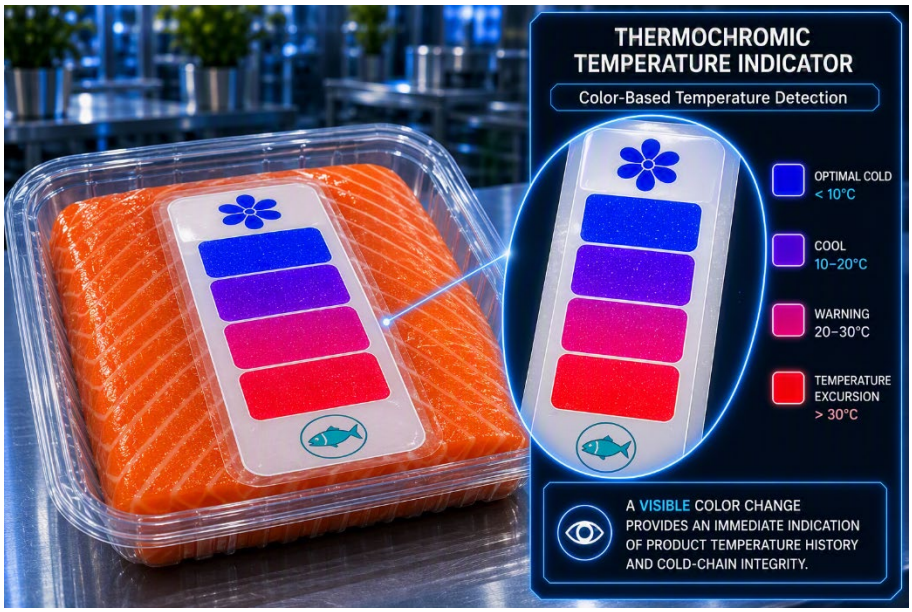
Licensing Opportunity

TTO – Technology Transfer Office

Edible Thermoelectric Temperature Indicator



Ref. Nr

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Keywords

Thermoelectric device, food-grade, biodegradable

Intellectual Property

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Publications

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Description

Current thermoelectric devices use toxic, non-biodegradable semiconductors and batteries, making them unsafe for food contact and generating e-waste. The new technology replaces these with entirely food-grade, edible hydrogels—such as chitosan, alginate, and gelatin—functionalized with salts to create flexible p-type and n-type thermoelectric generators. These harvest thermal energy (20–60°C) to directly drive an integrated anthocyanin-based electrochromic display, yielding a self-powered, biodegradable temperature indicator requiring no electronics or external power.

Advantages

The device is entirely food-safe and edible, containing no toxic metals or synthetic plastics. It is battery-free, harvesting thermal energy to power an integrated electrochromic display without external circuitry. Made from abundant, low-cost natural polymers and salts, it is biodegradable and produces zero electronic waste. Its thin, flexible form factor is tuneable and scalable, offering intuitive visual temperature alerts for sustainable smart packaging.

Applications

• Smart Food Packaging: Disposable edible temperature indicators for perishable goods and cold-chain logistics, replacing electronic data loggers with zero-waste monitoring.
• Pharmaceutical & Medical: Single-use biocompatible indicators for vaccines and ingestible sensors where toxic electronic residues are unsuitable.
• Consumer Goods: Sustainable, temperature-reactive packaging and utensils that visually signal safe conditions as an eco-friendly market differentiator.
• Cold-Chain Logistics & Quality Assurance Logistics providers and food distributors for single-use pallet-level or box-level temperature breach detectors.