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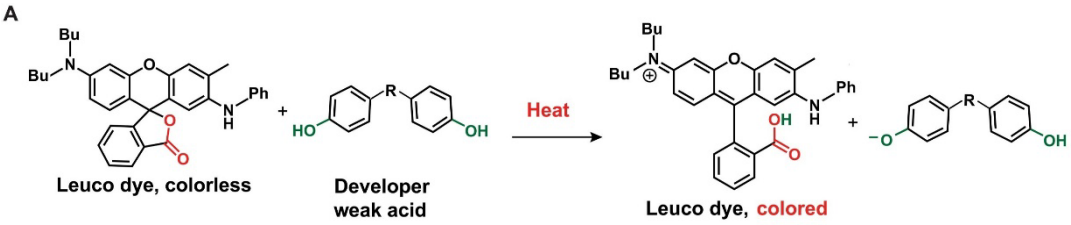
Licensing Opportunity

TTO – Technology Transfer Office

Bio-based colour developer for thermal printing



Color-forming reaction occurring in thermal paper: reaction scheme of traditional bisphenol color developer with the leuco dye (e.g., ODB-2)

Ref. Nr

6.2518.1

Keywords

Thermal paper, Color developer, Leuco dye, BPA-free / BPS-free, Phenol-free

Intellectual Property

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Publications

Nelis et al., Sci. Adv. 12, eadw9912 (2026)

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Description

A new class of bio-based color developers for leuco dyes used in direct thermal printing. The compounds are phenolic esters derived from p-coumaric acid or ferulic acid, which can be produced from renewable lignin or vegetable oils. On heating, their acidic hydroxy groups protonate the leuco dye, triggering a sharp, durable color change — the same mechanism used in conventional thermal paper, but with a fundamentally safer and more sustainable chemistry than today's standard developers.

Advantages

Unlike BPA/BPS — endocrine disruptors restricted in the EU — and unlike the petroleum-based replacements Pergafast 201 and D-8 (EPA-listed "moderate hazard"), these developers are both bio-based and show reduced endocrine activity, achieved through ortho-methoxy substitution and an ester bridge that lowers affinity for endocrine receptors. They deliver equal or, in some cases, superior performance to BPA, with outstanding thermal sensitivity, stability for at least 6 months under light and normal temperatures, and a tunable lipophilic/hydrophilic balance. Sourced from abundant, low-cost lignin — a pulp-mill byproduct — they offer a cost-competitive, renewable alternative to expensive bio-based options such as ascorbic acid.

Applications

- Point-of-sale (POS) thermal paper — receipts, ATM slips, and kiosk printouts
- Thermal labels, tickets & tags — logistics, retail, and transportation applications
- Bio-based chemical feedstock — a high-value outlet for lignin-derived monomers (p-coumaric/ferulic acid