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An updated status about the color developers currently used in thermal papers and available on the French market

Anne Hillenweck, Marine Valleix, Elodie Person, Sylvie S. Chevolleau, Olha Tsykhotska, Blas-Y-Estrada F, Laurent Debrauwer, Daniel Zalko

► To cite this version:

Anne Hillenweck, Marine Valleix, Elodie Person, Sylvie S. Chevolleau, Olha Tsykhotska, et al.. An updated status about the color developers currently used in thermal papers and available on the French market. ISSX 2022, Sep 2022, Seattle (USA, United States). hal-04406185

HAL Id: hal-04406185

<https://hal.science/hal-04406185>

Submitted on 19 Jan 2024

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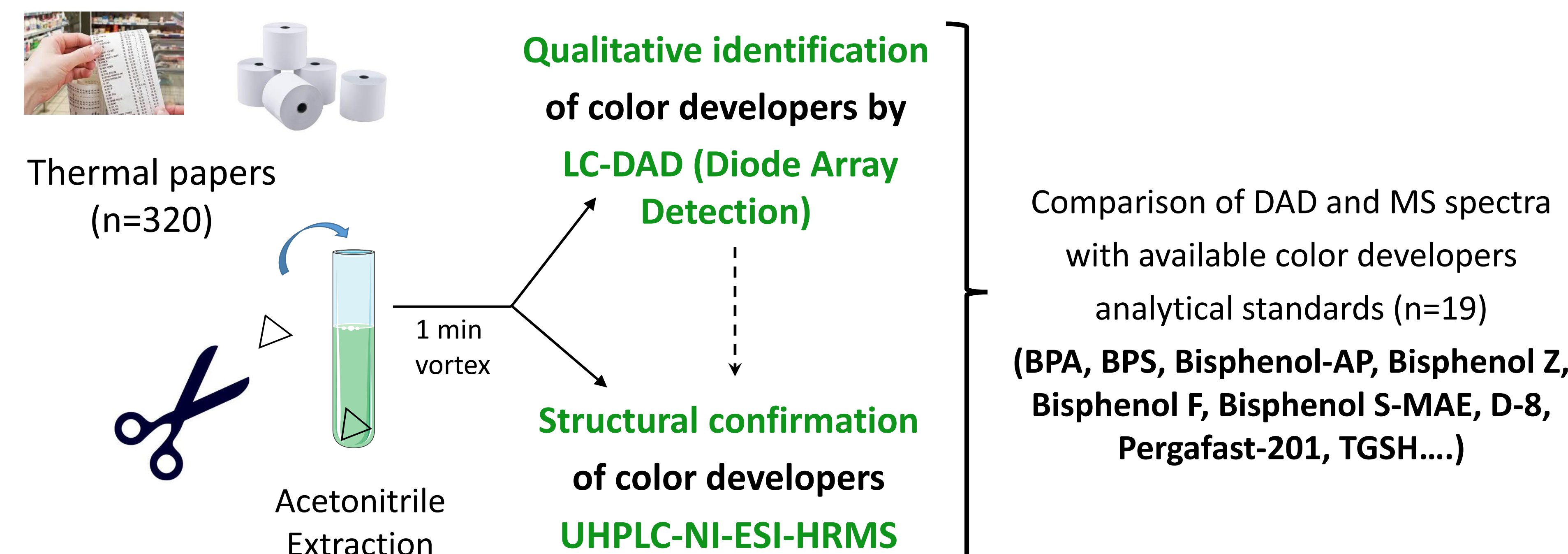
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Hillenweck A.¹, Valleix M.¹, Person E.¹, Bruel S.¹, Chevolleau-Mege S.², Tsykhotska O.¹, Blas-Y-Estrada F.¹, Debrauwer L.², Zalko D.¹
 INRAE Toxalim (Research Centre in Food Toxicology), Université de Toulouse, INRAE, ENVT, INP-Purpan, UPS, 180 chemin de Tournefeuille, 31027 Toulouse, France
¹Metabolism and Xenobiotics (MeX) Team, ²Axiom-Metatoul Team,

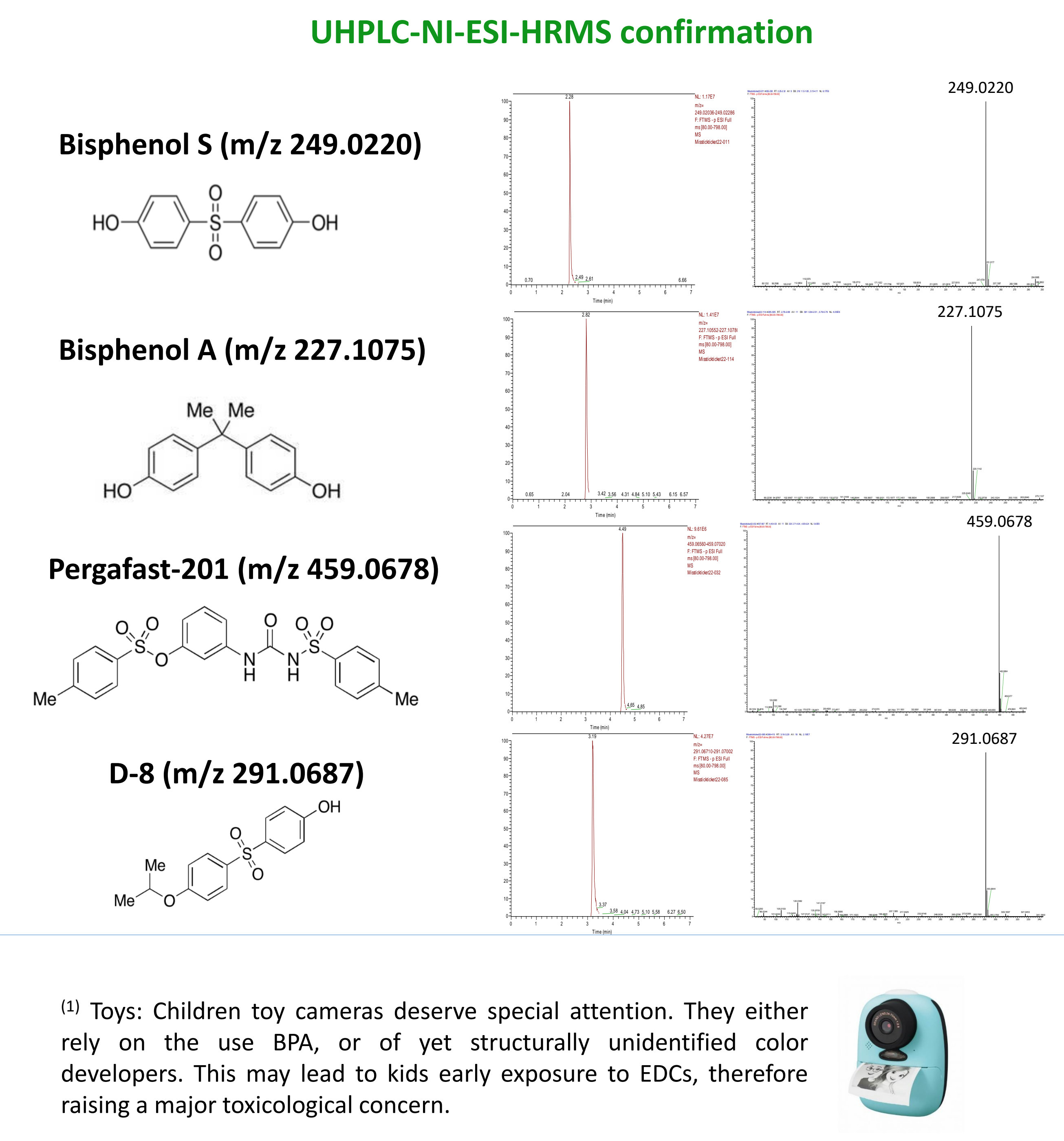
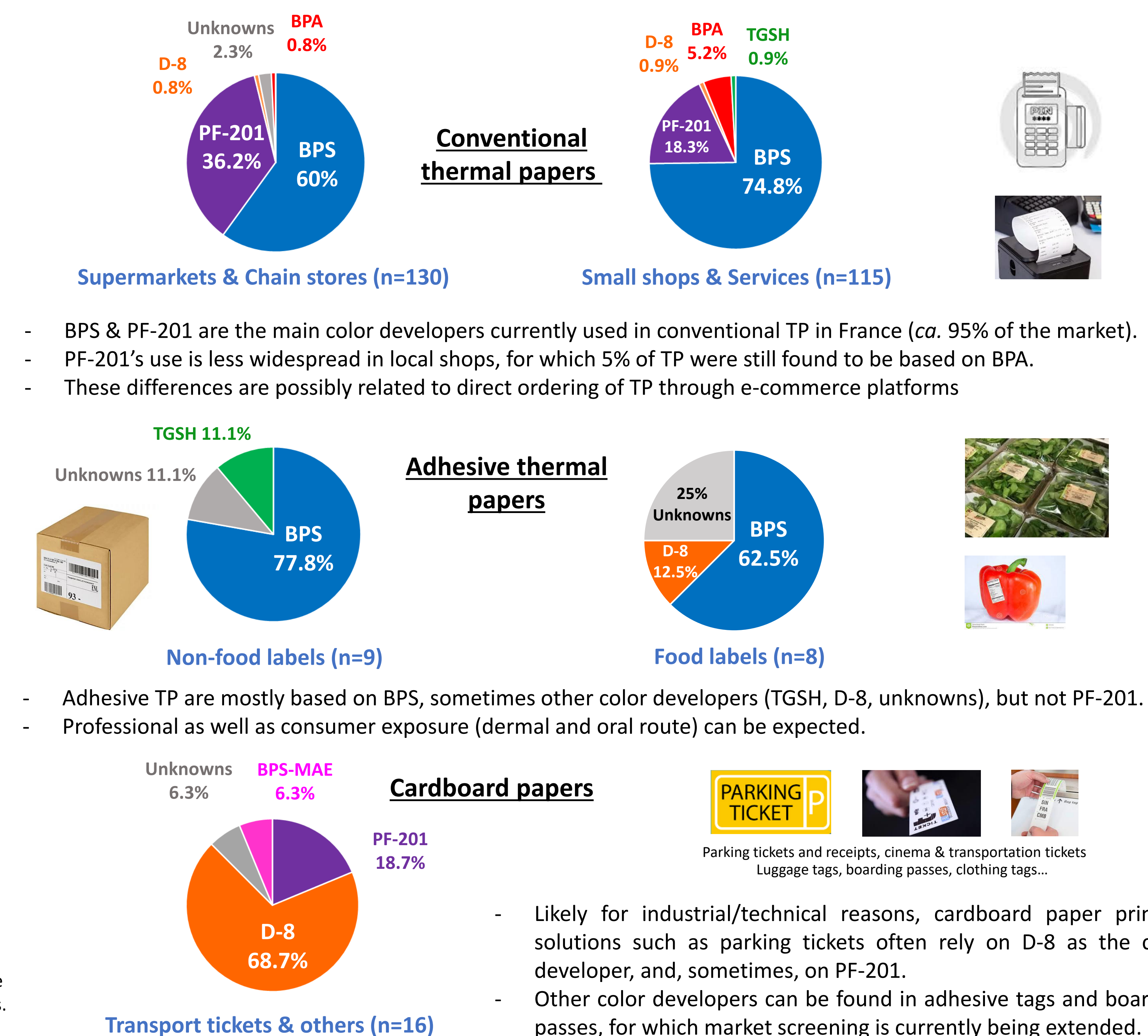
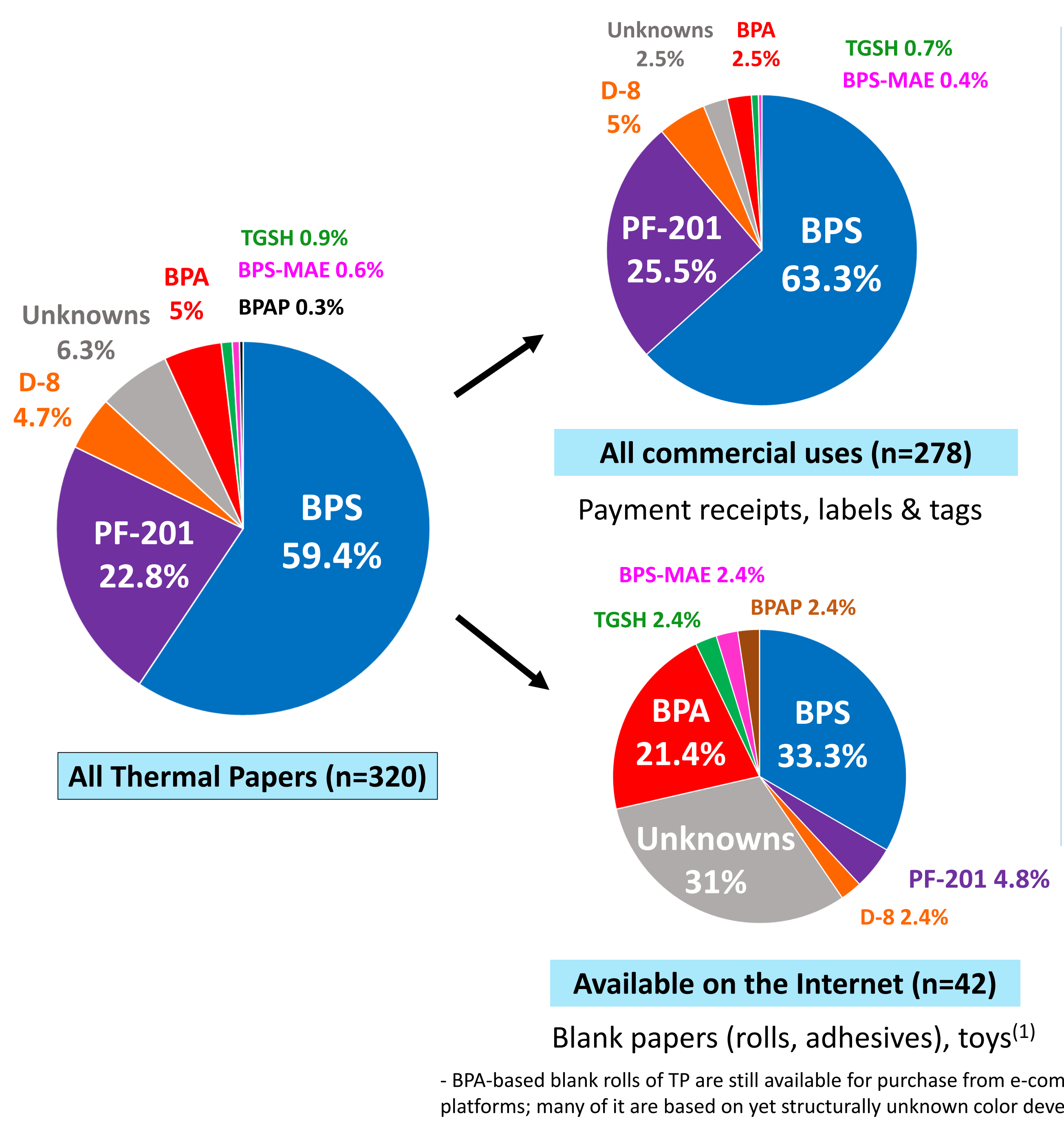
Context of the study

- Thermal printing (TP) solutions are increasingly used, with a worldwide market of TP papers estimated over 4 billion \$ in 2021, and expected to exceed 6 billion \$ by 2028.
- Due to their capability to act as proton donors, bisphenols such as Bisphenol A (BPA) are commonly used as color developers in TP, including point-of sale solutions, but also self-adhesive labels (parcels, foods) and several other types of TP solutions.
- BPA is a xeno-estrogen. Following demonstration that dermal exposure to this endocrine disrupting substance (EDC) can occur as a result of TP handling, the EU drastically limited the use of BPA in TP by January 2020 (<0.02% w/w). Alternative substances used for similar purposes are not regulated. These include BPA analogues such as Bisphenol S (BPS, a suspected EDC), but also D-8 and other color developers such as Pergafast-201 (PF-201), which toxicity and potential to penetrate skin are barely documented so far.
- We collected over 300 TP papers between April 2020 and May 2022 in France, from supermarkets, small stores, but also internet sellers. These included receipts, adhesive tags, self-service food scale stickers and even children toys. The objective was to reach a comprehensive overview of the substances in use, before proceeding to the examination of their fate, related hazards and potential to cross the human skin barrier.

Methodology



Results



Conclusions

- Our results show that ca. 60% of the French market of thermal papers nowadays consists of BPS. PF-201's use (ca. 23%) is on the rise, as in many other countries.
- Despite current EU regulations, 5% of thermal papers were found to contain BPA, mainly as a result of the availability of BPA-based TP solutions from e-commerce platforms (>20%).
- Other color developers such as D-8, TGSH, BPS-MAE and Bisphenol AP were occasionally identified. Unknown color developers were observed in 6.3% of analyzed thermal papers.
- D-8 was mostly detected in parking and public transport receipts. It appears to be the most common color developer used in cardboard papers.
- Quantification of major color developers, investigation of related hazards and of expected trans-dermal human exposure to these substances are further being explored in this project.