Suspect Screening Analysis of Recycled Consumer Products

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Background and Goals

Background: A near-field exposure pathway of interest concerns consumer products that are manufactured using recycled waste. The chemical composition of a recycled product can be influenced by the original composition of the source material and any potential additions that occur during the recycling process, intentional or not. Non-targeted (NTA), or more specifically, suspect screening, analysis can provide a high-throughput method for rapidly identifying these chemicals. Data mining techniques can be applied to find clusters of chemicals that either co-occur in particular products or have similar functional use, in an attempt to identify novel exposure sources. These clusters can later be prioritized for confirmation using chemical standards.

Goals: Identify chemical composition of virgin and recycled consumer products using suspect screening analysis. Use hierarchical clustering to identify potential exposure sources via co-occurring chemicals.
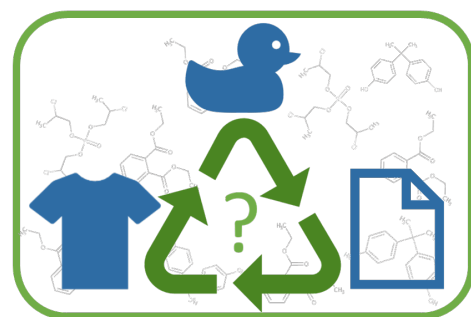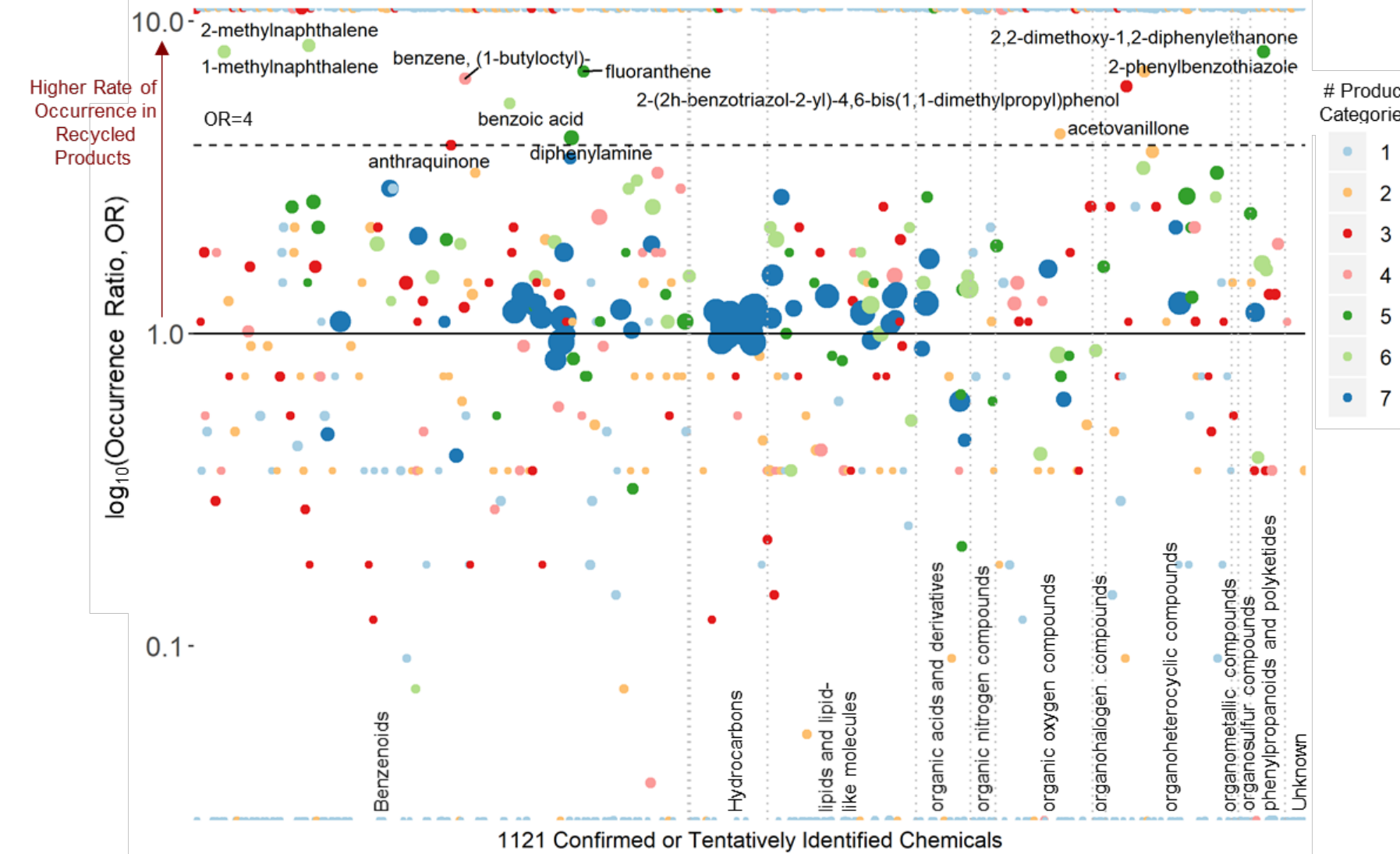
## Workflow for Recycled and Virgin Product Analysis
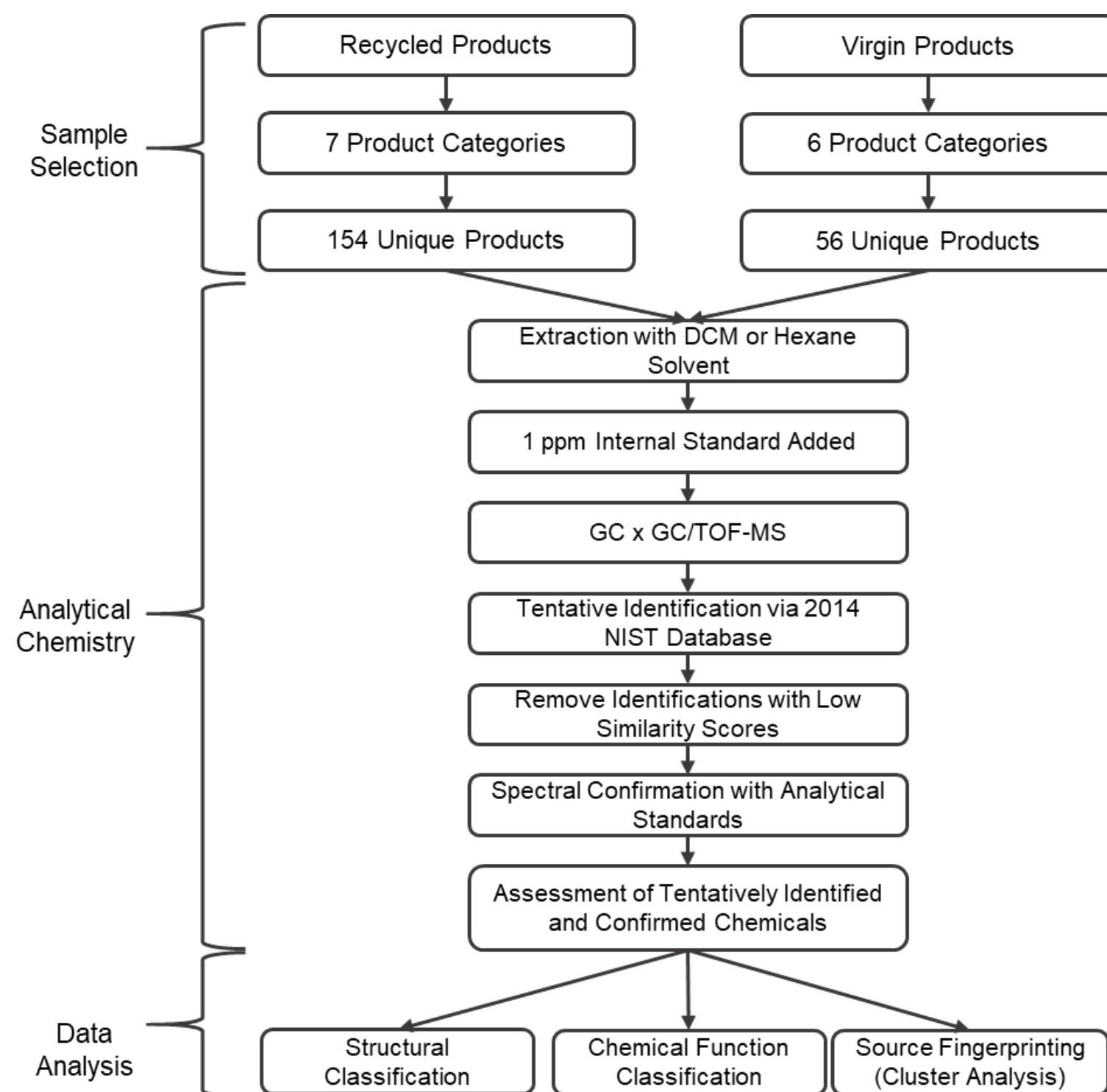
Workflow indicating selection of samples, the analytical chemistry performed to identify chemicals, and how this data was analyzed.

## Chemicals Identified in Recycled and Virgin Products

Occurrence of confirmed and tentatively identified chemicals in virgin and recycled products. The number of products in which each product was identified is indicated by the size of the data point.

Functional Uses for Identified Chemicals
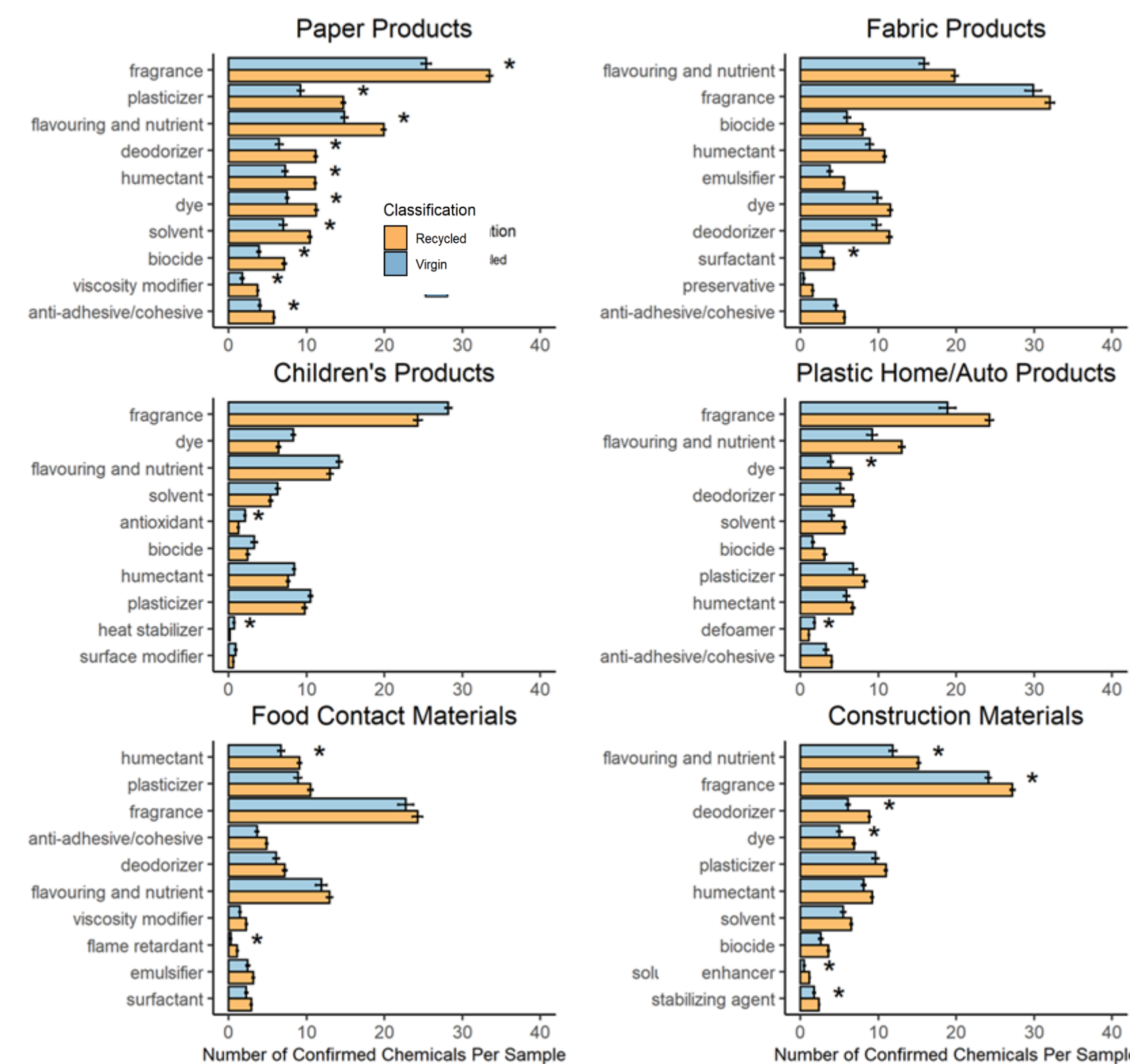
Functional uses of confirmed and tentatively identified chemicals found in product groups

Hierarchical Clustering of Identified Chemicals
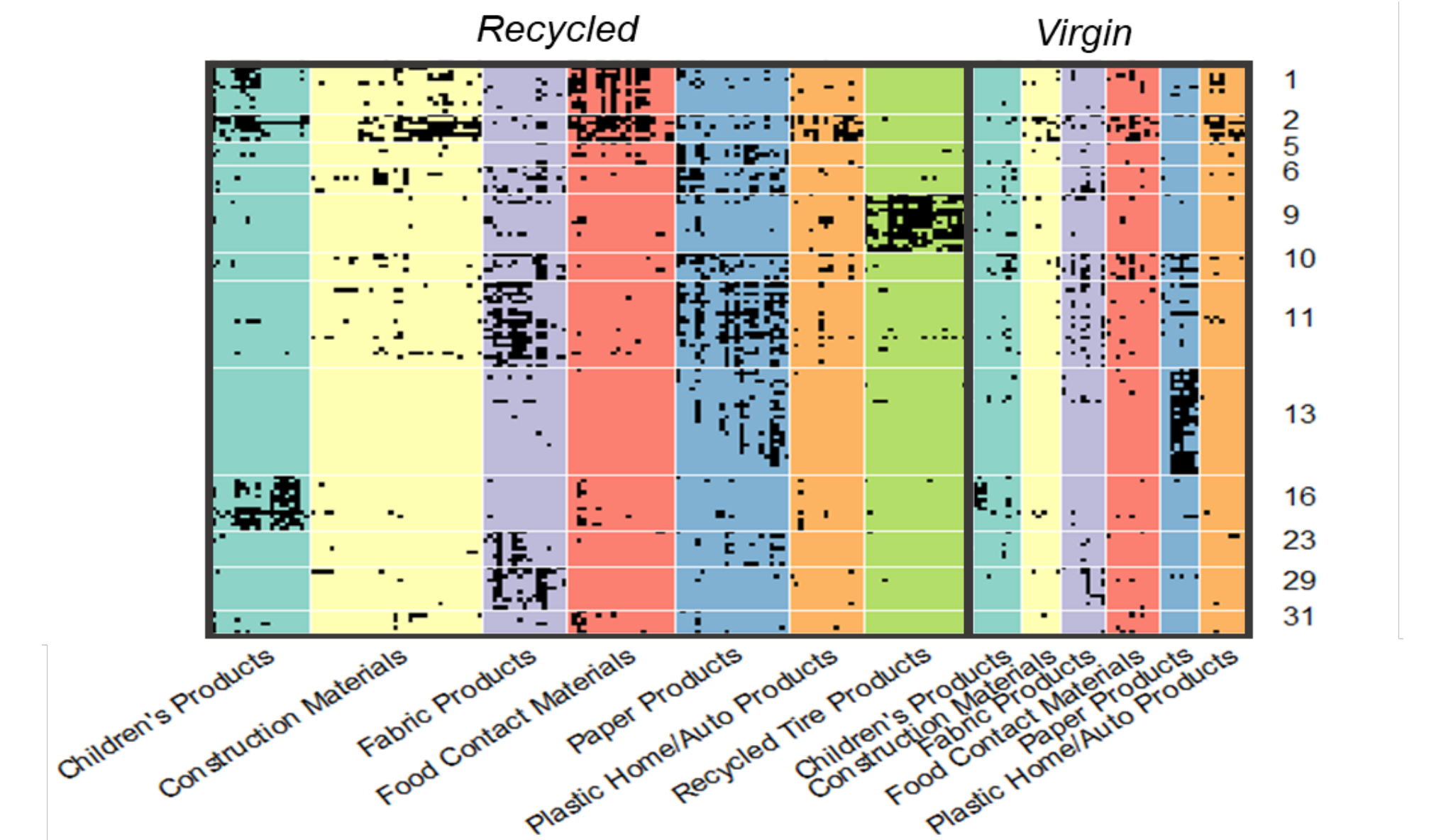
Hierarchical clustering of confirmed and tentatively identified chemicals within product groups. Clusters of lower interest are omitted for clarity.

Clusters of Chemicals Identified in Products

Cluster ID	Number of Chemicals	Primary Categories of Occurrence	Frequently Occurring Uses, Sectors, or Functions
1	13	Recycled products: children's products, construction products, food contact materials	Pesticide actives and inerts
2	7	Recycled and virgin children's products, construction materials, food contact materials, plastic home/auto products	Plastics and plastics manufacturing (including intermediates), polymer additives (UV stabilizer, antioxidant, odor agent)
5	6	Recycled paper products	Manufacture of ink, paints/coatings, or paper surface treatments; pesticides
6	7	Recycled construction materials, fabric products, and paper products; virgin fabric products	Manufacture of ink, paints, or dyes; use in ink, toner, and colorant products
9	15	Recycled tire products	Intermediates, rubber components, and processing aids used in the manufacture of rubber products or rubber tires, or in recycling
10	7	Recycled and virgin fabric and paper products; virgin children's products and food contact materials	Manufacture of plastics, including plasticizers or plasticizer precursors and other polymer additives.
11	22	Recycled and virgin paper products and fabric products	Cleaning product, ink, and apparel manufacturing; solvents, fragrances, biocides, dyes, flame retardants
13	27	Recycled and virgin paper products	Dyes and dye manufacturing, fragrances, pigments and pigment manufacturing
16	14	Children's products	An alternative plasticizer used in children's products due to its low toxicity; adhesives, colorants, and chemicals used in their production
23	9	Recycled fabric and paper products	Fragrances, flavorants, manufacturing of chemicals, cleaning and washing
29	11	Recycled and virgin fabric products	Flame retardants, fragrances, apparel manufacturing
31	6	Recycled and new food contact materials	Polymer additives (e.g., odor agent, stabilizers); intermediates

Clusters of chemicals identified as co-occurring in multiple products and/or across multiple product categories