Per- and polyfluorinated alkyl compounds (PFAS) analysis of textiles and food contact paper products

SCIEX The Power of Precision

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Introduction

This poster describes a targeted method to improve the characterization of PFAS in textiles and food contact materials (FCMs) to ultimately improve our knowledge of PFAS exposure sources. The enhanced sensitivity of the Triple Quad version of SCIEX 7500 system allows for ultra-low detection limits in these commercial products. PFAS in textiles can be absorbed through the skin, or washed off during cleaning to subsequently enter water systems. PFAS in FCMs can be transferred to food items and ingested (Figure 1).

PFAS are used extensively in commercial products, primarily for their stain-resistant properties to repel both water and grease. Although these properties are advantageous for consumers, their potential to act as PFAS exposure sources to humans is concerning to scientists and regulators.

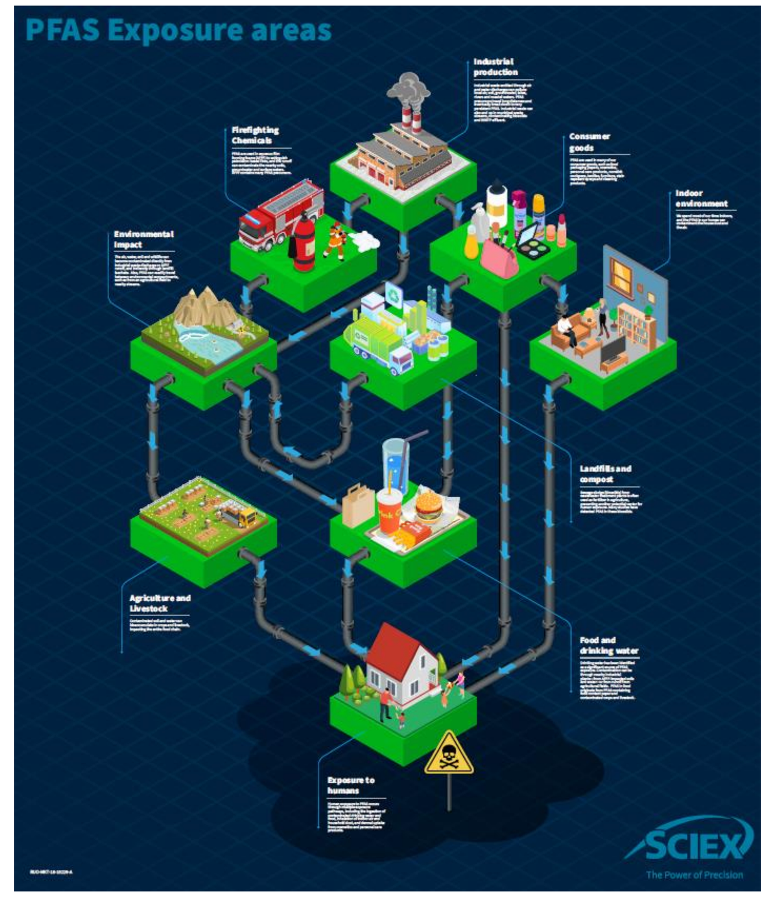

Figure 1. The entire PFAS life cycle influences human exposure, including textiles and food contact materials

SCIEX 7500 system

Methods

- Various textiles (tablecloth, pillow protector and several shirts) were purchased from commercial sources. All products identified as containing some PFAS compounds or having stain repellency properties.
- FCMs were obtained from local eateries without knowledge of potential PFAS content.
- A 10 x 10 cm piece of textile or FCM was cut into small pieces, placed in a 15 mL plastic centrifuge tube, spiked with mass-labelled PFAS standards, and 10 mL of methanol added. The tube was sonicated for 30 min, centrifuged and a 1 mL aliquot was transferred to a polypropylene vial for analysis
- Chromatography performed using an Exion AD system modified to replace the fluoropolymer tubing with PEEK. The delay and analytical columns were the Phenomenex Luna Omega PS C18. Mobile phases were water and methanol, both modified with 10mM ammonium acetate. A 12 min gradient was used with a 10 µl injection volume.
- Samples were analyzed using the Triple Quad version of the SCIEX 7500 system in negative electrospray ionization mode. Data were acquired using the Scheduled MRM with compound-specific optimized parameters.

Detection of PFAS in commercial textiles

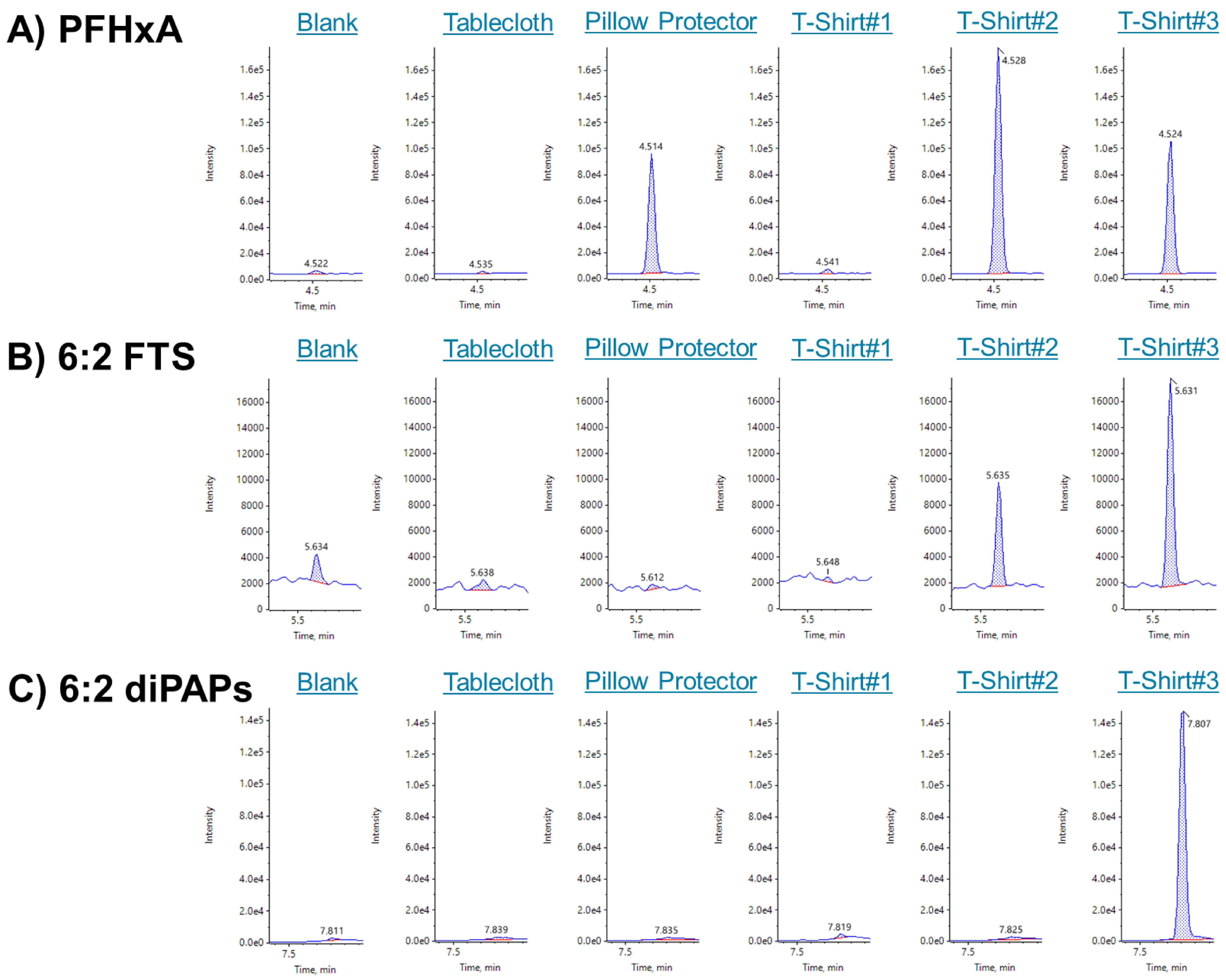

Figure 2. Selected PFAS compounds detected in the textile samples. Extracted ion chromatograms (XICs) for PFHxS (top panel), 6:2 FTS (middle panel) and 6:2 diPAPs (bottom panel) in the extraction blank, tablecloth, pillow protector and three different t-shirts.

Textiles key findings:

- C4-C11 perfluorinated carboxylic acids (PFCAs) were detected but their profiles varied by sample
- C5-C11 PFCAs were detected in the pillow protector and C4-C6 PFCAs were detected in t-shirt #2
- 6:2 fluorotelomer sulfonic acid (FTS) and 6:2 diPAPs were detected in t-shirt #3 (Figure 2)
- Perfluorinated sulfonic acids were not detected in any sample

Food contact materials

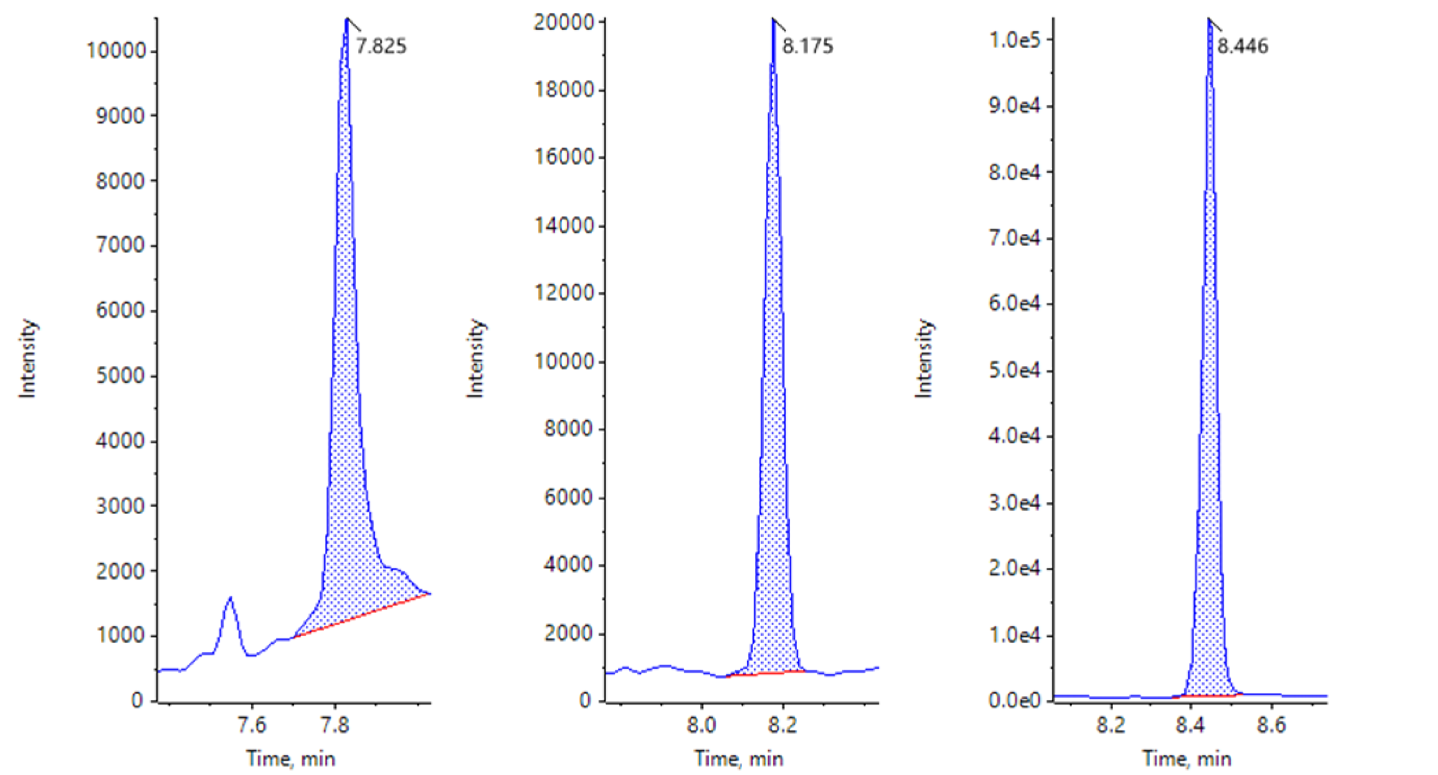

Figure 3. Detection of diPAPs compounds in a food wrapper. Suite of 6:2 diPAPs, 6:2/8:2 diPAPs and 8:2 diPAPs were detected in 4 of 5 FCM samples.

FCM key findings:

- PFAS profiles differed by sample
- 6:2 diPAPs, 6:2/8:2, diPAPs and 8:2 diPAPs detected in 4 of 5 samples (Figure 3)
- C4-C8 PFCAs were detected in only 2 of 5 samples
- 6:2 FTS detected in 2 samples that did not contain PFCAs