GODFREY & KAHN

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Technical Sidebar

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As one of the nation's largest testing laboratories, Pace® routinely gets requests to test consumer products for PFAS. When contacted, the very first question we ask clients is: "What specifically are you seeking to test, and more importantly, why?" The answer varies—from "we need to demonstrate our product is PFAS-free," to something more specific such as "we need to test our product for total organic fluorine to evaluate compliance with California Assembly Bill 2515."

The purpose of this sidebar is to focus on Total Organic Fluorine (TOF), since it is one of the more prominent testing thresholds cited in California and certain other state PFAS restrictions.

Although there are various single tests that can measure pieces of the fluorine picture, the term "total" matters. Although Total Organic Fluorine (TOF) is a prominent testing threshold called for under California and other state PFAS laws, the term is often misunderstood. "Total" implies capturing all PFAS contributions, including regulated carboxylic acids such as PFOA, sulfonic acids such as PFOS, and—importantly for consumer products—polymeric PFAS, specifically fluoropolymers (think TEFLON™ and many others). Collectively, this universe includes 15,000+ per- and polyfluoroalkyl substances.

Many PFAS contributors will not be fully quantified using adsorptive or extraction-based approaches. Fluoropolymer PFAS are very large molecules, generally not soluble in water, and therefore are not captured well—if at all—by many common analytical techniques used for extractable PFAS fractions.

For many consumer product matrices, the most practical way to estimate Total Organic Fluorine is a two-test, sum-parameter approach.

First, the product is tested for Total Fluorine (TF), which captures both organic and inorganic forms of fluorine, including inorganic fluoride. Total Fluorine is typically measured using combustion ion chromatography. In this method, the product is combusted at temperatures exceeding 1,000°C, converting fluorine-containing constituents into a measurable form, and total fluorine is quantified by ion chromatography. This approach can capture fluoropolymers and other challenging PFAS chemistries, if present, since high-temperature combustion breaks them down.

Second, a separate test is performed to quantify inorganic fluoride (IF). This analysis uses methods such as ion-selective electrode or ion chromatography—without combustion—to isolate and quantify the inorganic fluoride contribution.

The sum-parameter calculation for TOF is then straightforward: Total Organic Fluorine (TOF) = Total Fluorine (TF) – Inorganic Fluoride (IF).

Put simply, TOF is calculated by taking the total fluorine result and subtracting the inorganic fluoride contribution, yielding an estimate of the organically bound fluorine in the product.