

Ronald V.

Emmons (Presenter) — 1. The University of Toledo, Toledo, OH, United States

Aghogho A. Olomukoro — 1. The University of Toledo, Toledo, OH, United States

William L. Fatigante — 1. Bruker Scientific, Billerica, MA, United States

Brian Musselman — 1. Bruker Scientific, Billerica, MA, United States

Emanuela Gionfriddo — 1. The University of Toledo, Toledo, OH, United States

Title

SPME-DART-MS Provides a Rapid Screening Tool for PFAS Analysis

Introduction

Polyfluoroalkyl substances (PFAS), also known as “forever chemicals,” have become of major concern due to their presence in the environment as well as potential health implications. To better meet the regulatory demands of rapid screening and quantitation of these chemicals, this work evaluates hyphenating solid phase microextraction (SPME) with direct analysis in real time (DART) for their efficacy in quantitating 4 model PFAS. Furthermore, a central composite design (CCD) was implemented to better probe the influence of DART conditions on the ionization and fragmentation of PFAS.

Methods

A DART ionization source was interfaced to a Bruker EVOQ Elite. DART parameters were established for PFAS with sulfonic acid moieties (400°C, 50 V) and carboxylic acid moieties (200°C, 300 V) with nitrogen gas. PFAS extraction from water was performed utilizing SPME devices consisting of hydrophilic-lipophilic balance/weak anion-exchange (HLB-WAX) particles embedded in polyacrylonitrile (PAN). The extraction of PFAS samples was demonstrated to allow efficient preconcentration to lower limits of quantitation to sub-ppb levels.

Preliminary Data or Plenary Speakers Abstract

This project has demonstrated that DART-MS is a very sensitive method for the ionization and quantitation of multi-class PFAS. Careful tuning of DART parameters such as plasma temperature and electric grid voltage are essential for these analytes, these conditions effecting each compound class differently, as demonstrated by CCD. Combining DART-MS analysis with the preconcentration obtained via SPME, Preliminary results demonstrate LOQs of approximately 5 – 10 part-per-trillion (ppt) for four model analytes, namely GenX, PFBS, PFOA and PFOS with upper linear limit up to 5000 ppt.

Novel Aspect

A DART-MS/MS is investigated to confirm presence of specific PFAS in thin film SPME extracts enabling less time intensive screening.