Abstract Submitted
for the GEC20 Meeting of
The American Physical Society

Decomposition of PFAS compounds in contaminated well water using plasma reactor with dielectric water barriers J.E. FOSTER, J. GROELE, University of Michigan — PFAS is a persistent contaminant now ubiquitous in the environment and particularly in freshwater bodies. The contaminant is derived from industrial processing, fire fighting foaming agents, and consumer products such as nonstick coatings. This contaminant bio-accumulates in humans and can be a source of a variety of diseases including cancer. PFAS compounds feature the fluorine carbon bond, which is among the strongest in organic chemistry making it difficult to decompose by conventional means such as advanced oxidation. The bond can be destabilized via reduction processes driven by solvated electrons. Reduction driven decomposition of PFAS has been demonstrated by the Clarkson group using a multidischarge apparatus with argon gas. The multidischarge improves the plasma liquid contact surface area. Recently a plasma reactor with dielectric layers has been developed at Michigan that optimizes the plasma liquid contact surface area by disposing water into a multiplicity to narrow water jets with high surface area to volume. Plasma can be excited between the water jets akin to a packed bed dielectric barrier discharge but in this case with water as the dielectric barriers. The plasma is in contact with significant surface area and can be considered de facto in volume water treatment. This high contact area geometry affords plasma electrons to solvate through much of the water as it passes through the reactor. We demonstrate the ability of this device to efficiently decompose PFAS using air as the cover gas. The time evolution of PFAS contaminated well water as a function of time is presented for water derived from two highly contaminated wells with and without pretreatment (removal of suspended solids associated with the well water). Resulting plasma induce water chemistry is also commented upon.

Abstract APS
APS

Date submitted: 17 Jun 2020 Electronic form version 1.4