High-Energy Ball Milling

PFAS Destruction Treatment

cyclopure

Mechanochemical Process

Cyclopure has developed a method to destroy PFAS in solid state, following their removal from water by DEXSORB adsorption. This process employs high-energy ball milling to mineralize solid PFAS waste. Utilizing rotational energy in a "planetary" formation, the ball mill generates continuous attrition forces that produce reactive electron and radical species that break the C-F bonds in PFAS. Ball milling achieves full destruction in complex mixtures of co-contaminants and matrix constituents, converting waste to inorganic salts.

Concentration of Extracted PFAS to Solid State

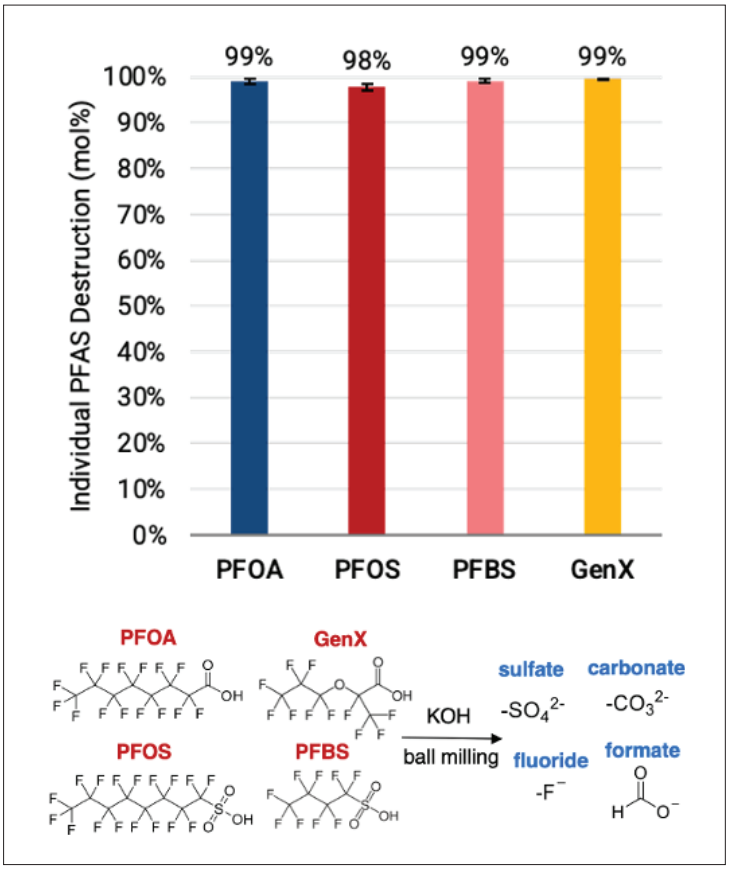
DEXSORB is uniquely capable of desorption of PFAS after use. Spent media is processed under ambient conditions in a low-volume solvent wash, where PFAS waste are separated from the adsorbent. Regeneration solvent is recycled through a reverse osmosis process, producing low masses of solid PFAS waste. Cyclopure has demonstrated a 5,000x concentration factor from treated water to waste stream. Once in solid state, PFAS waste can be processed by ball mill operations, as well as other destruction technologies.

Operational Efficiencies

Advantages of the ball milling process include small footprint, operation at ambient conditions, and low 120V power requirement. No further treatment required for post-destruction waste. Compatible with solvent wash desorption solution. Importantly, this process yields insignificant amounts of volatiles (0.016% by PFAS mass after 24-hour operation).

Quantifiable PFAS Destruction

High-energy ball milling is effective at destroying a wide range of PFAS, including PFOA, PFOS, PFBS, and HFPO-DA (GenX). Successful >99% destruction with quantitative fluoride recovery has been validated in the presence of salts and NOM. The destruction process operates in series of successive carbon-fluorine hydrolysis reactions until all carbon-fluorine species have been eliminated.



PFAS Waste Disposal Under RCRA

Cyclopure's regeneration process and ball mill method separate and concentrate PFAS waste from DEXSORB for full chemical destruction. This eliminates the cost and CERCLA liability of processing PFAS-laden waste associated with other adsorption media. A benefit of this process is that once extracted PFAS have been desorbed, DEXSORB can be used again for non-drinking water PFAS treatment applications.