Tackling Forever Chemicals PFAS for Environmental Stewardship

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Per- and polyfluoroalkyl substances (PFAS) have been widely used in various products such as non-stick cookware and fire-fighting form. Due to their non-degradable properties ascribed to the extraordinarily strong C-F bonds, they are so-called forever chemicals and consequently drinking water has been largely contaminated with toxic PFAS. Thus, the objective was to study PFAS treatment toward finding a simple chemical decomposition approach, in comparison to conventional destructive approaches inevitably requiring energy-intensive extreme conditions. A recent paper reported the potential of powerful oxidizing radicals (simply generated from persulfate (chemical oxidant) activated by Ag (transition metal)) to decompose PFAS under ambient conditions without energy input. Then, the reactivity of other metals for the activation of persulfate to decompose PFAS was questioned in this research. Cu was chosen to quickly answer the question because Cu is a known co-catalyst to boost the reactivity Ag. Indeed, Cu (abundant and less toxic than Ag) was also effective to decompose PFOA (one of the predominant PFAS). Interestingly, the Ag/Cu dual metal system showed 2 times faster PFOA decomposition kinetics and 10 times more fluorine release, compared to Ag or Cu alone, and also made a progressive PFOA decomposition over time (catalytic behavior). Detailed results on the radical generation and decomposition mechanism were discussed. Meanwhile, as an effort to promote public awareness, a series of jargon-free K-12 eye-level factsheets on emerging chemicals were created and distributed to local communities. Since removing PFAS in water is a challenging but significant task to protect the environment, this research would have a high impact on contributing to environmental stewardship.

Awards Won: