matCARE™: A Novel Technology for Efficient Remediation of PFAS-Contaminated Wastewater and Soil

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Background/Objectives. Per- and polyfluoroalkyl substances (PFASs) have been widely used in industries due to their unique properties that have not been evidenced from other compounds. These unique properties include their simultaneous hydrophobicity and oleophobicity, thermo/chem-stability, etc. Consequently, their wide use applications, such as in fire-fighting foams, has led to their global distribution. Unfortunately, PFASs are environmentally persistent, bio-accumulative, toxic and resistant to typical environmental degradation processes (Filipovic et al., 2015). For example, although perfluorooctane sulphonate (PFOS) and perfluorooctanoic acid (PFOA) were formulated in fire-fighting foam many years now, their persistence in the environment has led to significant loading of PFAS in terrestrial environment-both soil and water. Unless remediated these compounds are likely exist in the environment for several decades into the future. Therefore, their treatment is highly desirable (Fang et al., 2015).

CRC CARE has developed matCARE™ to remediate PFASs by removing them from wastewater or groundwater. This technology has been successfully used to remediate in excess of 2 million litres of waste water and immobilized the PFAS contaminated soil at RAAF (Royal Australian Air Force) sites in Australia.

Approach/Activities. matCARE is a modified clay-based technology that selectively removes PFAS from the aqueous phase or that present in soil. A matCARE™-based containerised mobile PFAS treatment plants is being used to remediate PFAS contaminated waste water. For the treatment system to function effectively fine colloid particles are removed prior to passing the water through matCARE™ filled cartridges. Water free of colloidal matter is extremely quick to remediate given the rapid flow rate through the cartridges containing matCARE™.

Results/Lessons Learned. Sorption is the major removal mechanism of this novel material. matCARE™'s sorption capacity for PFOS is 0.09 mmol/g which is 44 times greater than that of GAC Filtrasorb 400. When compared to Resin Dowex L-493, matCARE's sorption capacity is more than double, but matCARE is 14 times cheaper than Dowex L-493. CRC CARE treatment plants have successfully treated PFAS-contaminated water at RAAF Bases at Edinburgh, Townsville and Pearce, and PFAS-contaminated wastewater at Adelaide Airport in Australia. We are currently treating PFAS-contaminated wastewater at RAAF Base Townsville. Samples of the treated wastewater were regularly taken and analyzed by commercial labs and reported in quarterly reports to respective clients. All treated wastewater has had concentrations of PFAS below detection levels.

References:

Filipovic, A.W. M., Norström, K. Bibi, M. Lindberg, M and Österås, A. Historical usage of aqueous film forming foam: A case study of the widespread distribution of perfluoroalkyl acids from a military airport to groundwater, lakes, soils and fish, Chemosphere, 129 (2015) 39-45.

Fang, C., Megharaj, M. and Naidu, R. Chemical oxidization of some AFFFs leads to the formation of 6:2FTS and 8:2FTS, Environmental Toxicology and Chemistry, 34 (2015) 2625-2628.