

nano-matCARE™

Remediating PFAS-contaminated concrete



matCARE™ is a highly effective treatment that reduces human health risks from water, soil and concrete contaminated with per- and poly-fluoroalkyl substances (PFAS) such as perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA).

The historical use of aqueous film-forming foams (AFFFs) to fight fires has resulted in contaminated concrete and soils at commercial buildings and fire-training sites across Australia. To manage such contamination, CRC CARE developed matCARE, a modified natural clay-based adsorbent material activated with patented amino-chemicals, which immobilises PFAS and prevents contaminants from reaching sensitive environmental receptors.

Treating contaminated concrete without removing it

In many cases, it is unviable to remove contaminated concrete. CRC CARE has solved this problem by developing a nano-matCARE slurry application that locks up PFAS *in situ* without the need to remove the existing concrete structure.

The porous nature of concrete absorbs and accumulates PFAS into its internal structure. Without proper treatment and management, this contaminated concrete acts as a reservoir of PFAS, steadily leaching it into sub-building soil or surface water during rainfall events.

The remarkable performance of matCARE™ in remediating PFAS-contaminated concrete has been demonstrated by CRC CARE scientists at our testing facilities at the Global Centre for Environmental Remediation, University of Newcastle, Australia.

Background

The persistence, toxicity and bioaccumulation potential of PFOS – one of the most commonly used PFAS – has led to its listing as an emerging pollutant of concern in the Stockholm Convention Priority List. Toxicological studies have demonstrated that PFOS exhibits moderate acute oral and inhalation toxicity and slight acute dermal toxicity in test organisms. PFOS has also been detected in humans exposed to AFFF and has the capacity to bioaccumulate through the food chain – thus posing considerable long-term risks if left unmitigated.

Treatment with matCARE irreversibly locks up PFAS, completely preventing it from leaching out of contaminated concrete.

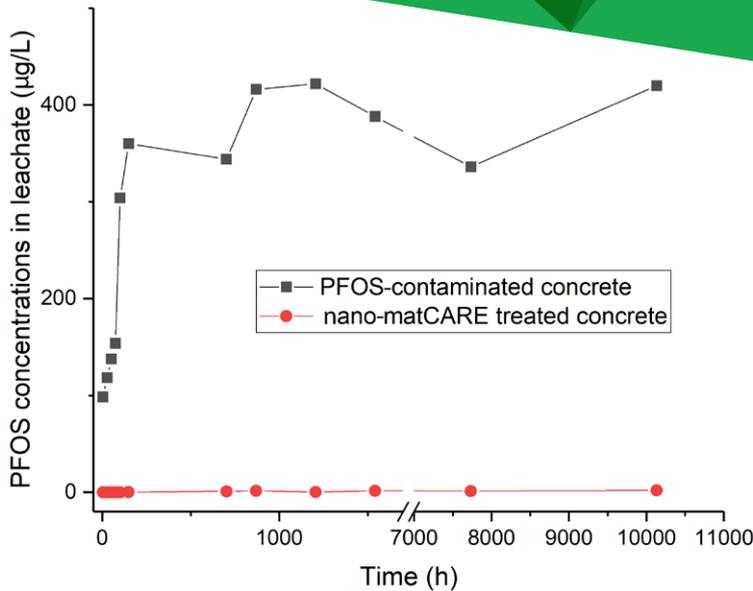


Figure 1: Comparison of PFOS leaching from contaminated concrete with or without nano-matCARE treatment.

CRC CARE's scientists have demonstrated matCARE's unparalleled ability to immobilise PFAS.

Cost-effective and efficient *in situ* treatment

Initially developed to treat PFAS-contaminated water and soil, matCARE is now available to treat contaminated concrete. CRC CARE's research has led to a new approach for *in situ* remediation, known as nano-matCARE, which eliminates the need for expensive demolition and disposal of contaminated concrete.

CRC CARE's research shows that:

- The isothermal adsorption study demonstrated that matCARE nano-powder has a maximal adsorption capacity of 57 mg of PFOS per gram of matCARE.
- The application of nano-matCARE slurry to PFOS-contaminated concrete locked up and prevented the leaching of more than 99.5% of the PFOS after 422 days (> 10,000 hours).
- nano-matCARE can effectively immobilise PFOS in concrete blocks and prevent it from leaching into the environment.

matCARE nano-powder is also effective in locking up other PFAS, including PFOA.

nano-matCARE is simple to implement and cost-effective compared with conventional approaches.

CRC CARE's risk-based remediation

CRC CARE has applied its world-leading risk-based approach to the problem of PFAS-contaminated concrete. nano-matCARE powders are easily mixed into contaminated concrete to irreversibly immobilise PFAS and prevent it from leaching out, protecting humans and other environmental receptors from exposure. Compared with concrete destruction and disposal, nano-matCARE treatment is a cost-effective and efficient field application for mitigating the risk associated with PFAS-contaminated concrete.

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