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Controlled release of environmental reactants – A green and sustainable approach to *in situ* soil and groundwater remediation

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The environmental science community has a collective interest in identifying viable and sustainable remedial solutions for groundwater contaminant plumes, seeking out remedies which reduce carbon footprint, minimize waste generation, and limit energy inputs required for remediation implementation, operations, and ongoing maintenance. Stakeholders could benefit from greener cleanup technologies, especially in light of future requirements to remediate vast dissolved phase plumes of emerging contaminants of concern such as 1, 4-Dioxane. Sustained and controlled release reactant technology involves coating or encapsulating environmental reactant materials to facilitate a more user-friendly *in situ* remediation implementation. The result is an efficient approach to ground water remediation which addresses the common challenges encountered with traditional liquid injection applications. Challenges include; contaminant rebound, plume migration, and the need for multiple mobilizations. Rather than pressurized liquid injection, the energy of concentration gradient driven diffusion as well as natural groundwater movement is used to deliver oxidants in the subsurface without the need for specialized injection equipment or expensive injection field services providers. Sustained and controlled release reactant materials can be applied to the subsurface in a number of forms and methods. Multiple remediation practitioners have applied these materials at sites across the US and Europe and in Canada and Brazil. Site examples will be presented including site selection, implementation design, cost, and monitoring data.

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