

New

Terra Systems, Inc.

SRS[®]-B_{uffered} Emulsified Vegetable Oil (EVO) Substrate

United States Patent# RE40,448

The anaerobic bioremediation process uses native or introduced microorganisms to degrade chlorinated solvents such as tetrachloroethene (PCE) and trichloroethene (TCE) to innocuous end products including ethene and ethane. An organic substrate must be added to the groundwater to generate reducing conditions and provide the necessary carbon and hydrogen to support biodegradation of the chlorinated solvents. Studies by Vainberg et. al (2006) demonstrated that between pHs 5.5 and 8.1, the greatest PCE reduction takes place with little dechlorination occurring under acidic conditions.

Terra Systems' SRS[®]-B_{uffered} emulsified vegetable oil substrate is designed to increase the pH in acidic aquifers to an optimal range and release bio-available hydrogen over a period of 3 to 5 years thus enhancing the long-term anaerobic biodegradation of the chlorinated solvents. SRS[®]-B_{uffered} optimizes the naturally occurring biodegradation system by supplying the rate limiting factor (in this case hydrogen) in the degradation of VOC's, certain pesticides/herbicides, perchlorate, and immobilization of certain metals (Cr, As, and some radionuclides).

SRS[®]-B_{uffered} Substrate Specifications

Terra Systems recommends that a pH buffer test be performed in our Treatability Laboratory to calculate the optimum amount of buffer to add to the SRS[®]-B. The SRS[®]-B package contains the following components:

Ingredient	Percent	Description
Food grade soy bean oil	40 - 60%	Terra Systems operates its own state-of-the-art manufacturing facility for SRS [®] -B _{uffered} production and can custom blend substrate packages as site conditions require.
Emulsifiers and proprietary nutrient package containing nitrogen and phosphorus	5 - 15%	Organic and inorganic nutrients support growth of the anaerobic microbial population.
Vitamin B ₁₂	<1%	He et al. 2007 demonstrated that vitamin B ₁₂ is an important micronutrient to enhance dechlorination activity. They found that 25 ppb of Vitamin B ₁₂ gave the maximum stimulation of dechlorination.
Sodium Lactate	4 - 7%	Soluble substrate to rapidly generate anaerobic conditions
Buffer	5 - 15%	pH 7 - 10
Water	20-46%	

KEY BENEFITS OF SRS[®]-B_{uffered} Emulsified Vegetable Oil (EVO) Substrate Include:

- SRS[®]-B sustains optimal pH conditions for dechlorination to occur
- SRS[®]-B promotes biodegradation of PCE and TCE to non-toxic end products
- SRS[®]-B slow release formula eliminates the need for continuous substrate additions
- SRS[®]-B contains only non-toxic food grade materials, which results in green, sustainable remediation
- SRS[®]-B can be used as a PRB to cut off plume migration
- SRS[®]-B is effective in treating source zones
- The in situ application of SRS[®]-B minimizes site disruptions
- Using SRS[®]-B reduces treatment time from decades to months and years

As a result of its low viscosity, slow release buffer and longevity, SRS[®]-B is an ideal substrate for injection using direct-push technology. The low viscosity allows a greater volume of SRS[®]-B to be applied in a shorter period of time and increases the substrate delivery radius per point. This results in fewer direct push delivery points and overall shorter delivery time requirements per site.

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