



# BGCR

Bio-Geo-Chemical Reduction

*Bio-Geo-Chemical Reduction (BGCR) is a microcrystalline cellulose electron donor combined with highly reactive ZVI*

## Benefits Include

Highest Hydrogen producing product in the market, guaranteed!

The MOST Economical solution compared to similar products

Applicable for in-situ soil and groundwater remediation applications

Ideal for mixed contaminant plumes of metals and organics

Combine with Dehalococcoides (DHC) bioaugmentation cultures to speed up the reduction process and reduce time of remediation

## Field Applications

Groundwater injections in soils with low or high permeability and fractured rock applications

Permeable reactive zones (PRZs) and Source Areas

Hydraulic or pneumatic fracturing

Soil Mixing or Trench PRBs

**Applicable to Treatment of many contaminants including:**

**Chlorinated Solvents**  
PCE, TCE, DCE  
And degradation products  
Other chlorinated compounds

**Heavy Metals**  
Hexavalent Chromium (CrVI)  
Arsenic  
Selenium  
And other heavy metals

C.E.R.E.S. Bio-Geo-Chemical Reduction (BGCR) is engineered to order and contains the **highest quality microcrystalline food grade cellulose** combined with oxygen scavenger, nutrients, and Vitamin B12 for biostimulation of anaerobes in groundwater for the bioremediation of chlorinated solvents, nitrate, some metals and nitrated explosives. BGCR also includes up to 70% Zero Valent Iron (ZVI) to combine chemical reduction and increase available hydrogen. Optional components include sulfate, other carbon sources, buffering agents, and other chemistries.

**ZVI options include Sponge Iron or Atomized, 4 μ up to 400 μ**

BGCR combines physical, chemical, and microbiological processes to create strong reducing conditions that stimulate dechlorination of organic solvents and other recalcitrant organics (e.g., perchlorate). The plant-based cellulose is nutrient rich, hydrophilic, and has high surface area; thus, it is ideal to support growth of bacteria in groundwater.



Material	% by wt
Cellulose	up to 80%
Zero Valent Iron	up to 70%
Fe, Mg or Ca Sulfate	up to 50%
Other carbon sources	up to 50%
Buffering agents	up to 5%
Ascorbate, B12, N, PO <sub>4</sub>	<4%

## Physical Properties

Form: Powder or Granular  
Solubility: Limited  
Color: white to gray  
pH: 6.5-7  
Particle Size: 4 μ up to >1,000 μ

**How it works:** Cellulose hydrolyzes and ferments to release a variety of volatile fatty acids, which serve as electron donors for dehalogenators and halo-respiring bacteria such as Dehalococcoides (DHC). Finally, small ZVI particles (i.e., 10 to 100 (micron) provide highly reactive surface area that stimulates direct chemical dechlorination, a lot of hydrogen via hydrogenolysis and maintains the reduced ORP of the groundwater established by the oxygen scavenger included in BGCR. Expect redox potentials as low as -600 mV!