

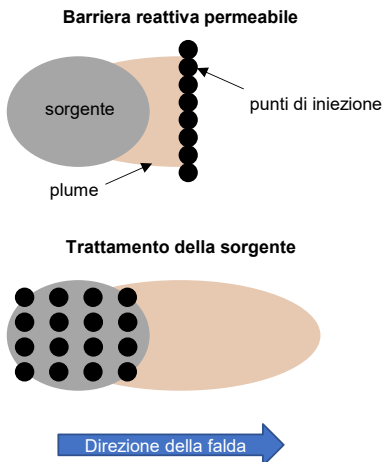
## IronGEL

### Highly effective in-situ chemical reduction

#### Viscoelastic reactive gel



#### Injection strategies



*IronGEL* is a reactive gel based on zero-valent iron for the in situ chemical reduction of recalcitrant organic (e.g., chlorinated solvents) and inorganic (e.g., heavy metals) contaminants. The gel can be injected underground to form a reactive zone for the treatment of secondary sources of contamination or to create a permeable reactive barrier for the treatment of pollutant plumes.

*IronGEL* is made up of microparticles of zerovalent iron (**ZVI**) with an average size of less than **10  $\mu\text{m}$** . **Thanks to its high reducing power, the product is particularly suitable for the reductive dehalogenation of chlorinated solvents and their conversion into non-toxic end products through the reductive  $\beta$ -elimination process.**

*IronGEL* formulation allows for the production, after dilution in water, of a **viscoelastic gel** with shear- thinning behaviour which gives the product high colloidal stability and good injectability and distribution capacity in the aquifer.

#### Broad-spectrum action

The engineered granulometric distribution gives *IronGEL* a high reactivity towards contaminants, and a consequent rapid initiation of the reductive processes in the subsoil, and a prolonged action of the remediation over time.

#### Advantages

- Broad-spectrum reducing action and high reactivity towards contaminants
- Optimized particle size distribution to maximize injectability and longevity of the product in the aquifer
- Viscoelastic stabilization for optimal distribution of the product in the subsoil
- Reduced volumes and simple preparation in the field thanks to the concentrated stabilizing formulation

## Directions for use

*IronGEL* consists of a concentrated suspension (40-50% by weight of ZVI) of microparticles containing biopolymer stabilizing agents.

The particle size distribution of the reactive component is adapted based on the specific characteristics of the project, in order to guarantee maximum flexibility and effectiveness of the product.

The field application phases include:

- Homogenize the concentrated suspension before application using mechanical stirrers/mixers.
- Dilute the product with water by adding the appropriate quantity of *IronGEL* (typical dilution ratio 1:10 – 1:20) and mix until a homogeneous product is obtained.
- Proceed with the product injection. Thanks to the optimal rheological characteristics of the viscoelastic gel, the injection can be performed using either through direct push systems, valved pipes, multiple injection stations or traditional wells/piezometers.
- At the end of the product application, it is recommended to inject a volume of water in order to remove any product residues inside the line and the injection point, thus avoiding the formation of deposits that could compromise subsequent applications.

## Product composition

Name	Content by weight
Zerovalent iron	40-60%, of which
	Fe > 95.0%
	O < 5.00%
	C < 0.05%
	N < 0.01 %
Al <sub>2</sub> O <sub>3</sub> ,MgO,MnO,CaO,NaO,SiO <sub>2</sub> < 0.5%	
Biodegradable carbohydrates	40-60%

## Product technical features

Parameter	
Physical state	Viscous liquid
Color	Black – metallic grey
Density	≈ 1.6-1.8 g/cm <sup>3</sup>
ZVI size range	0.1-10 μm
	D10 = 1.1 μm
	D50 = 2.8 μm
	D90 = 4.5 μm
Dilution ratio in water	from 1:10 to 1:23

pH in the final product diluted in deionized water in a ratio of 1:15	7-9
ORP in the final product diluted in deionized water in a ratio of 1:15	< -250 mV
Viscosity in the final product diluted in deionized water in a ratio of 1:15 (Brookfield LVTD, spindle 3, 25°C)	>750 mPa·s @ 1 rpm >100 mPa·s @ 60 rpm