



Office: 303.985.0609
Cell: 720.363.0548
www.foremostsolutions.com
isolite@ix.netcom.com
Lakewood, Colorado

ISOLITE®CG and Solid Oxygen Source for use in Wetlands

*** Isolite®CG (FES US Patent 5,733,067)**

Isolite®CG is produced from diatomaceous earth, formed in uniform granules with proprietary combustion, resulting in an extremely stable porous ceramic that will not break down or migrate in the soil. The majority of the internal pore spaces will support bacteria making it an ideal support matrix for bioremediation.

**** Solid Oxygen Source (EPA patent US 7,252,986) FES has been granted exclusive rights**

SOS granules are made of sodium percarbonate, coated with a proprietary blend of compounds that will slowly release oxygen. When applied in the soil with Isolite®CG, the released oxygen will disperse both in the Isolite®CG and the surrounding soil. A long-term super-rich saturation of oxygen in the soil or water is created, establishing robust colonies of biodegrading bacteria.

Physiochemical Properties of Isolite®CG

The most important physical parameter to be considered in the use of **ISOLITE®CG** is the biocompatibility of it with the biocatalyst. The chemical nature of the **ISOLITE®CG** composition must be such that the proteins or cells which are bonded to the surface are not inhibited, denatured, or poisoned by the support. Some of the unique advantages of **ISOLITE®CG** are the pore morphology. Pore morphology can be defined as the diameter, volume, and tortuosity of the pores. Pore morphology has a direct effect on the surface area available for bonding bioactive proteins, the diffusion coefficients of gas and liquids within the pores, and the apparent activity exhibited by immobilized biocatalysts, affinity ligands, and cells. This is the most important quality of **ISOLITE®CG**. **ISOLITE®CG** has an advantage over some of the other conventional porous-glass and ceramic supports in that the unique diatom skeletons contain submicrometer porosity which allows the **ISOLITE®CG** to “breathe.” The effect makes **ISOLITE®CG** less prone to diffusion-limited phenomena by allowing the permeation of nutritional oxygen into the deepest pores, especially when combined with SOS.

Pore Morphology

ISOLITE®CG's median pore size is 1.3 µm. The median pore diameter implies that there are just as many pores larger and smaller than the median pore. For immobilized cells, both pore diameter and pore volume are critical factors in selecting a support material. Pore volume is important because it controls the number of cells that

can be immobilized within the support. In other words pore volume controls the amount of biomass present within the biocatalyst support, which in turn controls the ultimate efficiency of the engineered system in which the support functions. The radius or wall thickness of **ISOLITE®CG** becomes critical because this dimension controls the diffusion-path length for nutrients and reactants to be transported to the bioactive cell or protein. Protein diameter and shape also determine the interstitial void volume for packed-bed reactors. Interstitial void volume affects the permeability of the bed and the pressure drop through the bed at a given flow rate. Both of these factors are important in the design and operation of a wetland system.

Mechanical properties of **ISOLITE®CG** are critical in the design and operation of a wetland because they determine how materials can be used and the expected life for the **ISOLITE®CG**. Important mechanical properties include crush strength, abrasion resistance, and flexure strength. For fluidized-bed reactors, particle density and attrition resistance are the most important mechanical properties. **ISOLITE®CG** has a particle density of 2.27 grams/cm³.

“Why are microbes important?” Microorganisms are living cells that are able to metabolize other chemical compounds and, as a consequence, produce useful products such as enzymes, hormones, chemical intermediates, or finished products. They are used principally in the fermentation of chemical products **and in waste treatment**. Another application for **ISOLITE®CG** is used in aquariums to immobilize Nitrosomonas and Nitrobactor microorganisms for the removal of ammonia. As little as 0.5 ppm ammonia is lethal to some types of aquatic life.

Packed Bed Reactors using ISOLITE®CG

ISOLITE®CG is used in packed-bed reactors for biologically treating contaminated aqueous streams. Smaller sizes of **ISOLITE®CG** are used where some fluidizing is necessary and in applications where the waste stream has a high organic content or high biological oxygen demand. Many advantages are to be had when using extruded cylindrical-shaped **ISOLITE®CG** to immobilize microbes. These include higher liquid throughput due to less pressure drop, less biomass fouling, less attrition, and easier operation.

