Basic Theory on the Disposition of Compounds

Basic Chemistry

Oxygen Release Compound (ORC®), is a proprietary formulation of magnesium peroxide. ORC is "oxygenated magnesia" which releases the oxygen upon contact with water. Magnesium peroxide is converted to magnesium hydroxide ($Mg(OH)_2$) as oxygen is released. This also is the fate of the magnesium oxide present in the formulation which simply hydrates to form the hydroxide. The reactions are:

$$MgO_2 + H2O \text{ Ù } 1/2\ O2 + Mg(OH)_2 \text{ ; and}$$
$$MgO + H2O \text{ Ù } Mg(OH)_2$$

Therefore, the uniform endpoint of ORC, from both compounds, is magnesium hydroxide. The safety of this material is easily conveyed by the fact that a suspension of magnesium hydroxide in water is ordinary Milk of Magnesia.

Free Magnesium

Levels of free magnesium coming from ORC or magnesium hydroxide are not a problem; both magnesium peroxide and magnesium hydroxide are virtually insoluble (Ksp = 1.8 X 10-11). Additionally, because ORC is contained in a filter sock, the magnesium compounds are contained and removable. Small particles of a few microns in diameter could leave the sock and be carried a limited distance in the sub-surface, before becoming part of the soil matrix. However, these compounds are simple minerals which microorganisms can metabolize using their internal organic acids to solubilize them.

Free Phosphate

ORC contains up to three percent of food grade potassium phosphate, specifically KH_2PO_4 (monopotassium phosphate or MKP) and/or K_2HPO_4 (dipotassium phosphate or DKP). The concentration cited is intimately bound to the crystalline structure of magnesium peroxide, though some phosphate may eventually be released since the potassium phosphates are water-soluble.

Even though a portion of the phosphate will remain with the spent product, to be conservative it may be assumed. If this is the case, the total volume of the water that will solubilize the extant phosphate must be evaluated to derive a concentration that could permeate the aquifer. It can be easily shown that the phosphate concentrations fall below 1 ppm in the immediate vicinity of the source well.

Qualitatively, several points should be made with respect to the benign nature of the phosphates in question. First, they are ingestible and harmless; they are used as meat moisturizers and in baby food. Regenesis uses a food-grade product for the extra purity. It is not imperative that it be food-grade to be safe the lesser grades are sold as fertilizer. Furthermore, the phosphates are invariably going to be metabolized by any of the sub-surface microorganisms-aerobic or anaerobic-since it is a basic nutrient that is essential to life. Its ultimate fate in living organisms, from microbes to mammals, is that it will become part of the ubiquitous array of biochemicals that contain phosphate.