ORC TECHNICAL BULLETIN # 1.3.2

Oxygen Release Compound, ORC®

pH Levels

Moderate pH levels are maintained when ORC is used in bioremediation. In relation to the insoluble nature of ORC, the pH increase remains highly localized. The elevated pH levels control biofouling and they do not migrate downgradient. The following field data from the North Carolina site suggests that such migration is minimal or very slow.

North Carolina Site Oxygen Barrier pH Measurements

Day	50' UG	ORC	10' DG	25' DG	50' DG	85' DG
7	6	11.3	5.9	6.1	6	6.2
21	5.9	10.5	6.1	6.5	6.1	6.2
49	6	10.1	6.1	6	6	6.3
70	5.9	8.8	5.7	5.9	-	6
137	5.9	11.1	6.1	5.9	-	6

Note: The pH of ORC is on the order of 9.0 and the hydroxide reaction products approach pH 10. In this experiment the ORC was delivered in a concrete matrix which provides a higher pH as observed in the ORC well - even at these levels there was virtually no migration. **UG = Upgradient; DG = Downgradient**

ORC (as MgO_2) and CaO_2 are both feasible as chemical oxygen sources, however, ORC has a pH which stays more highly localized at the source. Both oxides are converted to the respective hydroxides over time (as oxygen is released) and even larger pH differences are observed. The pH of CaO_2 reaction products can approach 13 while those of ORC stay below 10. Furthermore, since the solubility product of CaO_2 is much higher (K_{sp} = 5.5 X 10^{-6}) than MgO_2 as ORC (K_{sp} = 1.8 X 10^{-11}), the pH will not remain as localized.

These differences would be even more pronounced in systems more highly buffered than aquifer water. In buffered soil systems the pH is quite benign with ORC which stays below 8 at concentrations of more than 1% wt./wt. CaO_2, however, is difficult to use above .25% wt./wt. and generates a pH of close to 11 by the time it is present at 1% wt./wt.

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