

## **Innovative Carbohydrate (CH) Activation of Persulfate: Comparative Evaluation of Multiple Food-Grade CH Activators**

**Prasad Kakarla** ([pkakarla@insituoxidation.com](mailto:pkakarla@insituoxidation.com)), Yan Chin, and Will Caldicott  
(In-Situ Oxidative Technologies, Inc., Lawrenceville, New Jersey)

**Background/Objectives.** Sodium persulfate is traditionally activated using chelated iron, high pH/base, peroxide or elevated temperature/heat. Gradual loss of proper activation conditions or reaction stalling has been observed both under laboratory as well as field conditions typically due to peroxide consumption, iron precipitation, sub-optimal pH or the inability of the activator to carry the reaction towards complete persulfate consumption. Consequently, persulfate tends to decompose via non-free radical producing pathways (e.g., hydrolysis, transition metals) that tend to limit its treatment effectiveness and can cause significant oxidant wastage. Food grade carbohydrates (CH) provide an innovative method of activating sodium persulfate, which can be used both in the presence or absence of a pH adjustor (i.e., alkali) to ensure near-complete persulfate activation. As a follow up to previous work completed, additional experiments were designed to evaluate five different CH compounds both without alkali as well as varying concentrations of alkali with the objective to identify the most appropriate CH compound or mix, and optimize dosage and molar ratios for field application.

**Approach/Activities.** A series of experiments are currently underway to compare the effectiveness of five different food-grade carbohydrates. Experiments were planned in multiple phases with initial experiments focusing on persulfate activation to select the type of CH compounds and subsequent experiments evaluating varying conditions including alkali, oxidant and/or CH concentrations. Finally, treatment effectiveness towards organics will be evaluated.

**Results/Lessons Learned.** Experimental data collected to date have shown that the carbohydrate method of activation is capable of activating sodium persulfate either alone or in the presence of basic/alkaline conditions with enhanced persulfate decomposition noted under alkaline conditions in both soil-slurry as well as groundwater systems. Increasing persulfate decomposition was noted with increasing CH concentration when the alkali concentration is fixed relative to persulfate. Furthermore, CH activation was found to enhance treatment of chlorinated solvents and petroleum hydrocarbons over base activation alone. Results of the additional experiments will be available and presented by conference time.