247a Sulfate Radical Based Advanced Oxidation Technologies

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This study will provide an overview on sulfate radical generating reagents, a new and very promising class of advanced oxidation technologies. Known precursors of sulfate radicals include potassium peroxymonosulfate ($KHSO_5$) and persulfate ($K_2S_2O_8$), which can be activated thermally, photolytically, radiolytically or with the use of transitions metals. Similarly to all radical processes, once generated, sulfate radicals readily oxidize and degrade organic contaminants in water.

This study will focus on the transition metal and/or UV mediated activation of these inorganic peroxides. Novel chemical reagents, some of which appear for the first time in the field of environmental catalysis and are shown below, will be discussed:

$Co/KHSO_5$ and $Ag/K_2S_2O_8$

$UV/KHSO_5$ and $UV/Co/KHSO_5$

$UV/K_2S_2O_8$ and $UV/Ag/K_2S_2O_8$

These reagents demonstrated several operational advantages for the oxidation and degradation of environmentally important organic compounds. Those were due to the high oxidizing strength of the sulfate radicals formed, the high photosensitivity of the peroxides used and the pure catalytic activity of cobalt both homogeneously and heterogeneously. The study will also include methodology and results on the identification of the radicals formed and will elucidate the mechanism of radical generation from these interactions. The degradation pathway following sulfate radical attack on model aromatic contaminants will be depicted. Finally, the impact of specific water quality characteristics such as pH, buffering species both carbonate and phosphate, and chloride ions on the efficiency of these reagents will be discussed.