Photochemical Formation of Hydroxyl Radical in Red-Soil-Polluted Seawater in Okinawa, Japan Potential Impacts on Marine Organisms

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Abstract

Development of pineapple farmlands and construction of recreational facilities caused runoff of red soil into coastal ocean (locally termed as red-soil-pollution) in the north of Okinawa Island, Japan. In an attempt to understand the impacts of red soil on oxidizing power of the seawater, we studied formation of hydroxyl radical (OH radical), the most potent oxidant in the environment, in red-soil-polluted seawaters, using 313 nm monochromatic light. Photo-formation rates of OH radical showed a good correlation with dissolved iron concentrations (R = 0.98). The major source of OH radical was found to be the Fenton reaction (a reaction between Fe(II) and HOOH). The un-filtered red-soil-polluted seawater samples exhibited faster OH radical formation rates than the filtered samples, suggesting that iron-bearing red soil particles enhanced formation of OH radical.