

10th World Congress on
Green Chemistry and Technology

July 10-11, 2019 | Paris, France

Degradation of methylene blue by high energy gamma irradiation of solution containing carbon waste tire char

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Presence of dye molecules, even at very low concentrations, are undesirable and may significantly affect photosynthetic activity in aquatic systems by reducing light penetration and thus eutrophication and perturbations in the aquatic life. High energy gamma radiation was used by several researchers to degrade pollutants and decontaminate wastewater. Their treatments were carried out using high energy gamma radiation sources based on cobalt-60 (⁶⁰Co) with dose rates of 10-13 kGy/h. In our work, we used two different kinds of waste materials: radiographic sources that originate from the industry, which generate the high energy γ -radiation and carbon material obtained from waste tire granules used as an adsorbent matrix for degradation of methylene blue. Using carbon material in concentration of 100 mg/dm³ and radiographic source of ⁶⁰Co, which delivers a dose of 60 Gy complete decoloration of methylene blue was achieved. Decoloration with this combination was achieved very fast; it took only 20 minutes, to reach 90% of decoloration and complete decoloration of methylene blue solution (100%) was obtained after 100 minutes. The results confirm the hypothesis of a synergetic effect of methylene blue degradation by using a simple method of simultaneous application of two different kinds of waste materials, waste radioactive sources and carbon waste tire chair.