

Reduction of organic compounds in palm oil mill effluent using ultrasonic irradiation with and without activated carbon addition

ABSTRACT

Application of ultrasonic irradiation or sonication to wastewater treatment is well known technique. It is a safe, clean and effective method. Ultrasonic irradiation can also be used as a standard single process or it can be integrated or combined with other treatment methods. When water is exposed to ultrasonic irradiation, $H\bullet$ and $OH\bullet$ radical are produced. The latter is a strong oxidizing agent and can react with organic pollutants. In this study, raw and biologically treated palm oil mill effluent (POME) were used as test media to investigate the effectiveness of ultrasonic irradiation in reducing organic compounds based on chemical oxygen demand concentration. The media were subjected to three types of experimental conditions. They were ultrasonic irradiation, activated carbon and combination of ultrasonic irradiation with activated carbon. Results showed that the percentage reduction of chemical oxygen demand was highest when the test media were exposed to ultrasonic irradiation for 45 min after addition of activated carbon. The combined process achieved 63.1 and 95.6 % reduction of chemical oxygen demand for raw and biologically treated palm oil mill effluent, respectively. This indicated that ultrasonic irradiation after activated carbon addition improved the quality of both palm oil mill effluent effluents thus has potential to be used as tertiary treatment since it is capable of reducing the chemical oxygen demand level in biologically treated palm oil mill effluent to acceptable discharge level.

Keyword: Palm oil mill effluent; Chemical oxygen demand; Ultrasonic irradiation; Combination; Activated carbon