Removal of highly toxic components from hexanitrobibenzil wastewater by vacuum distillation

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ABSTRACT

Hexanitrobibenzil (HNBB) wastewater, generated in the first process during the synthesis of hexanitrostilbene, was treated using vacuum distillation. The effect of the treatment was determined using high-performance liquid chromatography, UV–Vis spectroscopy, gas chromatography–mass spectroscopy, and other physical and chemical analytical techniques. The concentrations of all of the nitroaromatic compounds were much lower in the distillate (2.21 mg/L) than in the wastewater (165 mg/L), and the chloride ions were completely removed by distilling the wastewater, indicating that the highly toxic components were efficiently removed by the vacuum distillation process. The concentrations of 14 types of nitroaromatic compounds that were detected in the HNBB wastewater were decreased by more than 98% by distilling the wastewater, but the 2,4-dinitrotoluene concentration was only decreased by about 67%. Toxicity tests based on the luminescence inhibition of Vibrio qinghaiensis sp. Nov were performed on the wastewater and its distillate, and the acute toxicity was found to be decreased by more than 96% by distillation. Vacuum distillation could be a useful method for removing these toxic and refractory components from other types of wastewater that are similar to HNBB wastewater.

Keywords: Vacuum distillation; Hexanitrobibenzil wastewater; Hexanitrostilbene; GC–MS; Acute toxicity

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