

Effects of adsorbents and copper(II) on activated sludge microorganisms and sequencing batch reactor treatment process

Abstract

Wastewater treatment systems employing simultaneous adsorption and biodegradation processes have proven to be effective in treating toxic pollutants present in industrial wastewater. The objective of this study is to evaluate the effect of Cu(II) and the efficacy of the powdered activated carbon (PAC) and activated rice husk (ARH) in reducing the toxic effect of Cu(II) on the activated sludge microorganisms. The ARH was prepared by treatment with concentrated nitric acid for 15h at 60-65°C. The sequencing batch reactor (SBR) systems were operated with FILL, REACT, SETTLE, DRAW and IDLE modes in the ratio of 0.5:3.5:1:0.75:0.25 for a cycle time of 6h. The Cu(II) and COD removal efficiency were 90 and 85%, respectively, in the SBR system containing 10mg/l Cu(II) with the addition of 143mg/l PAC or 1.0g PAC per cycle. In the case of 715mg/l ARH or 5.0g ARH per cycle addition, the Cu(II) and COD removal efficiency were 85 and 92%, respectively. ARH can be used as an alternate adsorbent to PAC in the simultaneous adsorption and biodegradation wastewater treatment process for the removal of Cu(II). The specific oxygen uptake rate (SOUR) and kinetic studies show that the addition of PAC and ARH reduce the toxic effect of Cu(II) on the activated sludge microorganisms.

Keywords

Biological wastewater treatment; Copper(II); Rice husk; Sequencing batch reactor; Simultaneous adsorption and biodegradation