Application of response surface methodology (RSM) for analyzing and modeling of nitrification process using sequencing batch reactors

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\textbf{ABSTRACT}

In this study, three parallel laboratory-scale sequencing batch reactors were operated to investigate the nitrification efficiency as a function of high concentration of ammonium, without and with the interaction of chemical oxygen demand (COD). In order to study the effects of COD and ammonium concentrations on nitrification rate, the experiments were conducted based on a central composite design and response surface methodology was used to analyze the achieved data. The experiments were conducted at different COD concentrations (0, 250, and 500 mg L\textsuperscript{-1}) and \(\text{NH}_4^+-\text{N}\) concentrations (200, 600, and 1,000 mg L\textsuperscript{-1}) in 13 runs. The five suggested mathematical models using the analysis of variance by Design-Expert software were applied to predict the response values. The nitrification rate decreased from 0.5 to 0.364 g \(\text{NH}_4^+-\text{N}\) L\textsuperscript{-1}g VSS\textsuperscript{-1}, when the COD concentration increased from 0 to 500 mg L\textsuperscript{-1}. This study contributed to a better understanding of the function of COD concentration in the system with high concentration of ammonium.

\textit{Keywords:} Ammonium; Sequencing batch reactor; Nitrification; Response surface methodology