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Plackett-Burman Design to Evaluate the Influence of Operating Parameters on Anaerobic Orthophosphate Release from Enhanced Biological Phosphorus Removal Sludge

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Abstract : The aim of the present study was to investigate the effect of a total of 6 operating parameters including pH (X1), temperature (X2), stirring speed (X3), chemical oxygen demand (COD) (X4), volatile suspended solids (VSS) (X5) and time (X6) on anaerobic orthophosphate release from enhanced biological phosphorus removal (EBPR) sludge. An 8-run Plackett Burman design was applied and the statistical analysis of the experimental data was performed using Minitab16.2.4 software package. The Analysis of variance (ANOVA) results revealed that temperature, COD, VSS and time had a significant effect with p-values of less than 0.05 whereas pH and stirring speed were identified as non-significant parameters, but influenced orthophosphate release from the EBPR sludge. The mathematic expression obtained by the first-order multiple linear regression model between orthophosphate release from the EBPR sludge (Y) and the operating parameters (X1-X6) was Y=18.59+1.16X1-3.11X2-0.81X3+3.79X4+9.89X5+4.01X6. The model p-value and coefficient of determination (R2) value were 0.026 and of 99.87%, respectively, which indicates the model is significant and the predicted values of orthophosphate release from the EBPR sludge have been excellently correlated with the observed values.

Keywords : anaerobic, operating parameters, orthophosphate release, Plackett-Burman design
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