



Taylor & Francis  
Taylor & Francis Group



# Support Vector Regression Prediction and Analysis of the Copper (II) Biosorption Efficiency

Nusrat Parveen, Sadaf Zaidi\* and Mohammad Danish

Department of Chemical Engineering, Aligarh Muslim University, Aligarh, India

**Abstract:** Support vector regression (SVR) has been used for the prediction of biosorption efficiency of Cu (II) using litter of natural trembling poplar (*Populus tremula*) forest (LNTPF) as a low-cost biosorbent. The proposed SVR model has been compared with the most widely used multiple linear regression (MLR) model based on statistical parameters for the unseen test data set in terms of coefficient of determination ( $R^2$ ), average absolute relative error, root mean square error and standard deviation. The SVR-based model is found to be superior to the MLR model. The effect of various parameters (adsorbent concentration, pH, particle size, initial Cu(II) concentration, agitating speed and temperature) on the Cu(II) biosorption efficiency using the SVR-based model has also been studied. The simulation results of the SVR-based model agree appreciably with the available experimental results. This novel application of SVR can be successfully applied to model other such systems with good accuracy and high generalization ability.

**Keywords:** Biosorption, Low-cost biosorbent, Support vector regression, Multiple linear regression (MLR).

## Nomenclature

$C$	cost function
$C_0$	initial Cu(II) concentration, $\text{mg L}^{-1}$
$f(\mathbf{x})$	regression function
$K(\mathbf{x}_i, \mathbf{x}_j)$	kernel function
$L$	Lagrangian function (dual form)
$Q^2_{\text{ext}}$	leave-one-out cross validation on the test set
$Q^2_{\text{Loo}}$	leave-one-out cross validation on the training set
$x_i$	Input vector
$y_i$	Output vector

\*Author for Correspondence. Email: [sadaf63in@yahoo.com](mailto:sadaf63in@yahoo.com)