

Optimization of neural network architecture using particle swarm algorithm for dissolved oxygen modelling in a 200L bioreactor PHA production

ABSTRACT

In a polyhydroxyalkanoates (PHA) production, optimized fermentation process helps in reducing overall cost by increasing productivity. Dissolved oxygen (DO) concentration influences growth rate which in turn affect the PHA production rate. Data driven technique using artificial neural network (ANN) is beneficial as process data based on real conditions are used. In this paper, we propose the use of particle swarm optimization (PSO) method in artificial neural network (ANN) model to determine the optimal number of neurons in hidden layer for modelling dissolved oxygen (DO) concentration in PHA fermentation process. The neural network is modelled using real production data from a pilot scale 200L fed-batch bioreactor. A comparison between the proposed ANN-PSO and ANN is provided. Simulation result shows that ANN-PSO eliminates the need for time consuming repeated runs and able to obtain similar number of optimal hidden neuron with improved model accuracy.

Keyword: Artificial neural network; Particle swarm optimization; Fermentation; Polyhydroxyalkanoates