Neural Network modeling of Hollow fiber CO_2 Separation Process

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Prediction of hollow fiber membrane performances and the corresponding separation factors are performed by using neural networks modeling. The multilayer perceptrons(MLP) backpropagation networks were employed and experimental data sets were used and the training set for separation of CO2 from N2. The MLP backpropagaion networks with 3 layers (1 hidden layer) provide excellent predictiong performances.
The model permits rapid solution of the governing differential mass and pressure distribution in a hollow-fiber gas separation modules using computational scheme that does not rely on commercial software and conventional numerical methods such as shooting techniques. For 1-stage, 2-stage and 3-stage configurations changes of required separation areas according to stage cuts are computed. A simple module predictive control technique is employed to provide optimal operation conditions based on the proposed model. Values of stage cuts can easily be identified for various desired mole fractions and recovery rates. From the results of numerical simulations, we can see that the proposed model can be effectively used in the control of gas separation process by hollow-fiber membrane modules.