The implementation of neural network for semiconductor PECVD process

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Abstract

In semiconductor manufacturing, the monitoring system has been developed very excellently and can be used for comprehensively collecting the historical data of process information and quality characteristics of equipment. However, due to the high turnover rate of personnel and the great variance in manufacturing process, the previous control technique by using intuition and experience of engineers for manufacturing process parameter settings to achieve good product quality is no longer appropriate. Therefore, this research establishes a quality predictor for analyzing the relationship between manufacturing process parameter setting and final product quality in the plasma-enhanced chemical vapor deposition (PECVD) of semiconductor manufacturing by applying the back-propagation neural network (BPNN) algorithm and Taguchi method. The experimental data are categorized into 500 pieces of training data and 150 pieces of verifying data. The proposed analysis method for using in the PECVD process of semiconductor manufacturing is verified by comparing the predicted film thickness of SiO2 and the predicted refractive index of silicon dioxide films with the measured data. According to the comparison result, the proposed model has an excellent prediction capability of final product quality and can be applied in process control for related manufacturing fields.

Keyword：Quality predictor; Plasma-enhanced chemical vapor deposition (PECVD); Back-propagation neural network; Taguchi method; Silicon dioxide films