

基于随机共振的气敏传感器阵列信号的识别研究

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摘要:

6只不同的碳纳米管气敏传感器用来识别甲醛、苯、甲苯、二甲苯4种挥发性有机物(VOC).传感器的响应输出在外加噪声的情况下通过单个阈值检测器,出现了阈上随机共振,使得传感器阵列采集的气体信号得到了增强.对不同种类的气体,最大互相关系数不同,而且对每类气体这个最大互相关系数是恒定的,因此能准确地用来代表不同种类的气体.实验结果表明基于随机共振的最大互相关系数法可以作为传感器阵列信号识别的一种新的算法,且准确度高.该方法在利用随机共振提高系统性能方面有很大的应用前景.

关键词: 随机共振 气敏传感器阵列 碳纳米管 互相关系数 BP网络

Study of the Gas Sensor Array data Classified Based on Stochastic Resonance

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Abstract:

Six carbon nanotubes gas sensors were chosen to compose a gas sensor array, which were all sensitive to formaldehyde, benzene, toluene and xylene. The gathered data from the sensor array were passed through individual single threshold detectors with added noise, and stochastic resonance (SR) occurred; which resulted in an enhancement, by noise, of the response of the system to gathered gas signals. For different gas classes "maximum cross-correlation coefficients" were found to be completely different, and this "maximum cross-correlation coefficients" was found to be constant for a particular class of gas. So these "maximum cross-correlation coefficients" can be used to accurately represent the different classes of gases. The experimental results showed that we were able to predict the four classes of gas with high accuracy by the method of "maximum cross-correlation coefficients" based on suprathreshold SR. This classified method has a good potential for the use of SR to improve system performance in similar applications.

Keywords: stochastic resonance; gas sensor array; carbon nanotubes; cross-correlation coefficients; BP network

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