

## 基于类Legendre基的气体传感器阵列信号的正交分解

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摘要:

提出了一种基于类Legendre基的气体传感器阵列响应信号的正交分解方法, 将时域信号转换到由类Legendre基张开的空间。使用电子鼻系统对齿轮油和机油两类挥发气体进行了检测, 对响应幅值进行正交分解, 应用前5个基函数建立的模型能准确地描述整个动态响应过程。提取展开系数为特征值建立PLS-CA定性分类和PLS定量分析的模型。结果表明, PLS-CA分离器实现了对两类样本的有效分类, PLS定量模型可以准确地预测挥发气体的浓度。说明基于类Legendre基提取特征参数的方法准确可行, 在应用时不需任何预处理, 为气体传感器阵列信号的处理提供了一种新方法。

关键词: 气体传感器阵列; 特征提取; 正交分解; 类Legendre基

## Orthogonal Decomposition of Gas Sensor Array Signals Based on a Quasi-Legendre Basis

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**Abstract:**

A new decomposition method based on an orthogonal quasi-Legendre basis is proposed, which decomposing the gas sensor array signals in the time domain to an alternative space spanned by a set of orthogonal functions. An electronic nose is applied to detect the volatile gas in the headspace of gear oil and machine oil. The signals are decomposed into five orthogonal quasi-Legendre functions, which preserve the meaningful information coming from the whole dynamic response. Accordingly, the resulted coefficients are used as fingerprints of the gas being tested. They are applied to build the PLS-CA discrimination models and PLS quantification models. The results show that two kinds of gases are clearly discriminated by the classifier, and the different concentrations of the gases are correctly predicted by the PLS calibration models. The feature extracting method based on quasi-Legendre basis is accurate and feasible, and it needs no any preprocesses, which provides a new way for the processing of sensor array signals.

**Keywords:** gas sensor array; feature extraction; orthogonal decomposition; Quasi-Legendre basis

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