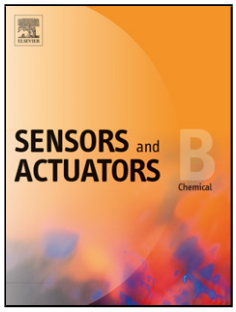

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Early Detection of Fires in Electrical Installations by Thermally Modulated SnO_2/Additive-Multi Sensor Arrays

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Abstract

In this work, a setup for generation and analysis of pyrolysis gases, which can operate multi gas sensor arrays of different SnO_2/Additive admixtures, is introduced. The gas sensor arrays are thermo-cyclically operated and are investigated towards their characteristic features of the resulting conductance-over-time profiles (CTPs) for identification and analysis of pyrolysis gases at low concentrations emitted for instance by overloaded electrical cables. Several SnO_2/Additive gas sensitive layers have been examined with pyrolysis gas related model gases like CO, methane and propene and were tested on their stability, sensitivity and characteristic CTP-features when exposed to pyrolysis gases of PVC insulation materials.

Keywords: Gas sensor; SnO_2; gas identification; thermo-cyclic operation; dynamic conductance; fire detection; pyrolysis; PVC

1. Introduction

Metal oxide gas sensors (MOG) have been reported to be appropriate for detection of conventional fires and smoke [1]. This ought to be also true for fires in electrical installations, as pyrolysis of cable materials leads to emission of distinct gas mixtures depending on insulation material composition and temperature [2]. However, the problem of cross-sensitivity, which is inherent to isothermally operated MOG, rigorously limits the analytical information gain when applied to complex gas mixtures and may give rise to false alarms. To overcome these limitations, several approaches such as signal processing (e.g. PCA, LDA, KNN or artificial neural networks [1,3,4]) have been employed. In this work, we present preliminary studies on a sensor array [5] which may be used for detecting fires in electrical installations and cabinets at early stages. The sensor array is operated thermo-cyclically with