Optimization of SnO_2 screen-printing inks for gas sensor applications.

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ABSTRACT

Conventional screen-printing inks are constituted of the active material , tin oxide in this study, organic and mineral binders. This last constituent is beneficial to the mechanical strength and adhesion of thick films, especially onto micro-hotplates, but is detrimental to the electrical properties required for sensor applications. An innovative solution consists in its replacement by a precursor which is transformed into SnO_2 during the thermal annealing of the layers. Inks containing a tin powder, an organic binder and either a gel or an alkoxide as precursor, with various compositions were studied. The organic binder is necessary to adjust the rheological properties of the ink, but it creates porosity and decreases the conductance. The addition of a gel allows to improve electrical properties but complicates ink preparation, and the adhesion remains insufficient. The use of an alkoxide (tin(II) 2-ethylexanoate) at a low content (15 wt%) combined with the organic binger (24 wt%) and tin oxide powder promotes both adhesion and conductance. Moreover, the low decomposition temperature of the alkoxide (300°C) allows to decrease the annealing temperature of the layers which reinforces the compatibility of screen-printing with micro-hotplate technology.

KEYWORDS :

Sensors (E), Screen-printing, Electrical Conductivity (C), Precursors-organic (A), Porosity (B)