Preparation of ZnO-Varistors

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"سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ
الْعَلِيمُ الْحَكِيمُ"

بسم الله الرحمن الرحيم

PREPARATION OF ZnO-VARISTORS

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AIM OF THE WORK

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The present study comprises the following:

1-Preparation of ZnO-varistors by conventional method using oxides as precursors.

2-Study the addition of Ce_2O_3 in the range of (2-6) mole % to ZnO standard mix containing 0.25 CoO, 0.25 Cr_2O_3.

3-Determination of physical properties (densification) and electrical properties.

4- Study of microstructure developed by SEM & EDAX.

I-INTRODUCTION

ABSTRACT

Early work on ZnO based varistor was largly limited to binary systems comprising ZnO and few mole percent of a second insulating oxide components. This leads to materials with a moderate degree of non-ohmicity, typical values for exponent of non-linearly, α-defined by $I \alpha V^{\alpha}$, lie in the region $2<\alpha<6$.

The superior electric properties were developed by ***Matsuoko*** in multi component ZnO-varistors, where α ranged between ($30< \alpha <50$). A typical multicomponent varistor has a composition 97% mol ZnO, 1% Sb_2O_3, 0.5 Bi_2O_3, 0.5 CoO, 0.5 MnO_2 and 0.5 Cr_2O_3.

The field of application of ZnO varistor in low voltage was extended to high voltage electric power stations by the addition of Pr_2O_3 substituting Bi_2O_3. The merits of the addition of rare earth oxides beside extending the field of application to high voltage is directly related to the microstructure based on two phase model. As this structure increases the active grain boundary area through which electric current flows.

The effect of addition of Ce_2O_3 on microstructure, electric properties was the subject of the present study. The results achieved showed that Ce_2O_3 could be used to improve the varistor properties in the presence of their oxides as Cr_2O_3 and CoO. Low additions of Ce_2O_3 entered into solid solution with ZnO therby rendering the material totally conductive and shows nearly ohmic relation. High addition on the other hand, showed signs non-linearty as proved from electrical properties measured. Microstructure of the product revealed the presence of two