

Optimizing Bi₂O₃ and TiO₂ to achieve the maximum non-linear electrical property of ZnO low voltage varistor

ABSTRACT

In fabrication of ZnO-based low voltage varistor, Bi₂O₃ and TiO₂ have been used as former and grain growth enhancer factors respectively. Therefore, the molar ratio of the factors is quite important in the fabrication. In this paper, modeling and optimization of Bi₂O₃ and TiO₂ was carried out by response surface methodology to achieve maximized electrical properties. The fabrication was planned by central composite design using two variables and one response. To obtain actual responses, the design was performed in laboratory by the conventional methods of ceramics fabrication. The actual responses were fitted into a valid second order algebraic polynomial equation. Then the quadratic model was suggested by response surface methodology. The model was validated by analysis of variance which provided several evidences such as high F-value (153.6), very low P-value (<0.0001), adjusted R-squared (0.985) and predicted R-squared (0.947). Moreover, the lack of fit was not significant which means the model was significant.

Keyword: Bi₂O₃; Modeling; Optimization; RSM; TiO₂; ZnO-varistor.