PEMBUATAN DAN KARAKTERISASI KERAMIK FILM TEBAL $La_{0,9}Ca_{0,1}FeO_3$ UNTUK SENSOR GAS ETANOL DENGAN MEMANFAATKAN Fe_2O_3 HASIL EKSTRAKSI DARI MINERAL YAROSIT

Nenden Ika Ariyani CD

NIM 1304611

Pembimbing 1 : Dr. Endi Suhendi, M.Si
Pembimbing 2 : Dr. Dani Gustaman Syarif, M.Eng

ABSTRAK

Fabrikasi keramik film tebal $La_{0,9}Ca_{0,1}FeO_3$ menggunakan Fe_2O_3 hasil ekstraksi dari mineral yarosit sebagai sensor gas etanol telah berhasil dilakukan. Penggunaan Fe_2O_3 hasil ekstraksi dari mineral yarosit sebagai bahan dasar dalam penelitian ini dilakukan untuk meningkatkan nilai tambah mineral yarosit. Serbuk Fe_2O_3 hasil ekstraksi dari mineral yarosit dan 10% mol CaO dilarutkan dalam pelarut HCl 10 M, serta serbuk $LaCl_3.7H_2O$ dilarutkan dalam pelarut aquades. Selanjutnya campuran larutan tersebut ditambahkan sejumlah NH_4OH hingga pH larutan 8 untuk menghasilkan endapan $La_{0,9}Ca_{0,1}FeO_3$. Endapan $La_{0,9}Ca_{0,1}FeO_3$ dikeringkan pada temperatur 100^0C kemudian dikalsinasi pada temperatur 800^0C selama 2 jam untuk menghasilkan serbuk $La_{0,9}Ca_{0,1}FeO_3$. Serbuk $La_{0,9}Ca_{0,1}FeO_3$ digerus untuk menghasilkan serbuk berukuran nanopartikel. Serbuk $La_{0,9}Ca_{0,1}FeO_3$ yang sudah digerus dicampur *Organic Vehicle* (OV) untuk menghasilkan pasta $La_{0,9}Ca_{0,1}FeO_3$. Menggunakan teknik *screen printing*, pasta $La_{0,9}Ca_{0,1}FeO_3$ dilapiskan diatas substrat alumina (Al_2O_3) kemudian dibakar pada temperatur 600^0C selama 2 jam untuk menghasilkan keramik film tebal $La_{0,9}Ca_{0,1}FeO_3$. Berdasarkan data hasil karakterisasi XRD (*X-Ray Diffraction*), keramik film tebal $La_{0,9}Ca_{0,1}FeO_3$ berhasil dibuat meskipun ada sebagian Fe_2O_3 tidak bereaksi. Hasil foto SEM (*Scanning Electron Microscope*) menunjukkan bahwa ukuran butir keramik film tebal $La_{0,9}Ca_{0,1}FeO_3$ hampir seragam, serta terdapat banyak pori (struktur poros). Pengukuran karakteristik listrik keramik sensor gas berbasis $La_{0,9}Ca_{0,1}FeO_3$ menunjukkan respon yang baik terhadap adanya gas etanol. Hasil karakterisasi sifat listrik memperlihatkan bahwa keramik film tebal $La_{0,9}Ca_{0,1}FeO_3$ memiliki nilai sensitivitas listrik tinggi serta temperatur kerja optimal yang rendah yaitu dalam rentang 290^0C – 295^0C.

Kata Kunci : $La_{0,9}Ca_{0,1}FeO_3$, Sensor Gas; Etanol; Keramik Film tebal; Mineral Yarosit;

FABRICATION AND CHARACTERIZATION OF THICK FILM CERAMICS $La_{0,9}Ca_{0,1}FeO_3$ FOR ETHANOL GAS SENSOR USING EXTRACTION OF Fe_2O_3 FROM YAROSITE MINERALS

Nenden Ika Ariyani CD

NIM 1304611

Pembimbing 1 : Dr. Endi Suhendi, M.Si
Pembimbing 2 : Dr. Dani Gustaman Syarif, M.Eng

ABSTRACT

Fabrication of $La_{0,9}Ca_{0,1}FeO_3$ thick film ceramics using Fe_2O_3 powder extracted from yarosite mineral as ethanol gas sensor has been successfully performed. Fe_2O_3 powder extracted from yarosite mineral as the basic material in this research can increase the added value of yarosite mineral. Fe_2O_3 powder from yarosite mineral and 10% mol of CaO dissolved in HCl 10 M were mixed with $LaCl_3.7H_2O$ powder dissolved in aquades.The solution of Fe_2O_3, $LaCl_3.7H_2O$ and CaO mixed and then was precipitated using NH_4OH. The $La_{0,9}Ca_{0,1}FeO_3$ precipitate was dried at temperature 100^0C and then calcined at temperature 800^0C for 2 hours to produce $La_{0,9}Ca_{0,1}FeO_3$ powder. $La_{0,9}Ca_{0,1}FeO_3$ powder was crushed to produce a nanoparticle-sized powder. Using the screen printing technique, the $La_{0,9}Ca_{0,1}FeO_3$ paste is coated on the alumina substrate (Al_2O_3) and then fired at 600^0C for 2 hours to produce thick film ceramic of $La_{0,9}Ca_{0,1}FeO_3$. Based on XRD (X-Ray Diffraction) characterization data, the thick film ceramics of $La_{0,9}Ca_{0,1}FeO_3$ were succesfully made even though some of Fe_2O_3 did not reacted. The analysis of thick film ceramics using SEM (Scanning Electron Microscope) showed that the grain size of the thick film ceramics of $La_{0,9}Ca_{0,1}FeO_3$ was almost uniform, and there were many pores (porous structure). Electrical characteristics data of ceramic based gas sensor of $La_{0,9}Ca_{0,1}FeO_3$ showed good response to the presence of ethanol gas. Electrical properties data also showed that the thick film ceramic of $La_{0,9}Ca_{0,1}FeO_3$ had high electrical sensitivity value and low optimum working temperature that is in the range 290^0C - 295^0C.

Keyword : $La_{0,9}Ca_{0,1}FeO_3$; Gas Sensor; Ethanol; Thick Film Ceramics; Yarosite Mineral;