SINTESIS DAN KARAKTERISASI SUPERKONDUKTOR $YBa_2Cu_3O_{7-x}$ DENGAN DOPING Ni MENGGUNAKAN METODE REAKSI PADATAN

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ABSTRAK

Penelitian ini bertujuan untuk mensintesis dan mengkarakterisasi superkonduktor $YBa_2Cu_3O_{7-x}$ dengan penambahan doping Ni menggunakan metode reaksi padatan. Penelitian ini merupakan penelitian eksperimen eksploratif yang dilaksanakan di Laboratorium Fisika Lanjut Universitas Pendidikan Ganesha. Adapun Tahapan dalam penelitian terdiri dari tahap sintesis dan karakterisasi. Tahap sintesis yaitu meliputi tahap penimbangan dan pencampuran, kalsinasi, kompaksi atau peletisasi, sintering dan *annealing*. Sampel yang sudah melalui tahapan sintesis kemudian dikarakterisasi menggunakan uji XRD, dan uji resistivitas. Data yang dikumpulkan kemudian dianalisis secara kualitatif dan kuantitatif. Secara kualitatif data dianalisis menggunakan analisis penyajian data. Sedangkan secara kuantitatif data dianalisis menggunakan analisis data statistik deskriptif.

Hasil penelitian sintesis dan karakterisasi Superkonduktor $YBa_2Cu_3O_{7-x}$ dengan penambahan doping Ni menggunakan metode reaksi padatan telah berhasil dilaksanakan sehingga didapatkan material superkonduktor berbentuk *pellet* dengan diameter 16 mm dan tinggi 3 mm berwarna hitam. Material superkonduktor teridentifikasi dengan adanya efek Meissner pada sampel superkonduktor dengan tinggi levitasi magnet sebesar ±2mm. Karakterisasi superkonduktor $YBa_2Cu_3O_7$–x dan $YBa_2Cu_{3-0.1}Ni_{0,1}O_7$–x ditunjukkan dengan hasil uji XRD yaitu didapatkannya puncak-puncak difraksi yang kemudian dianalisis nilai hkl. Struktur kristal yang dihasilkan adalah *Orthorhombic* dengan parameter kisi Kristal a= 3,834652 Å, b = 3,876 Å dan c = 11,5709 Å untuk sampel $YBa_2Cu_3O_7$–x. Pada sampel $YBa_2Cu_{3-0.1}Ni_{0,1}O_7$–x menunjukkan parameter kisi Kristal a= 3,804 Å, b = 3,906 Å dan c = 11,8083 Å. Berdasarkan uji Resistivitas, didapatkan nilai temperatur hitung dan resistivitasnya. Pada resistivitas 0,002 terdapat transisi yang menyebabkan Temperatur kritis masing-masing sampel berada pada suhu 91 K untuk Superkonduktor $YBa_2Cu_3O_7$–x dan 96 K untuk superkonduktor $YBa_2Cu_{3-0.1}Ni_{0,1}O_7$–x.

Kata-kata kunci: Sintesis dan karakterisasi, Superkonduktor $YBa_2Cu_3O_{7-x}$ dengan Doping Ni, dan Metode Reaksi Padatan

SYNTHESIS AND CHARACTERIZATION OF* $YBa_2Cu_3O_{7-x}$ *SUPERCONDUCTORS WITH Ni DOPING USING SOLID STATE REACTION METHOD

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ABSTRACT

This study aims to synthesize and characterize the $YBa_2Cu_3O_{7-x}$ *superconductor with the addition of Ni doping using the solids state reaction method. This research is an exploratory experimental research conducted at the Advanced Physics Laboratory, Ganesha University of Education. The stages in the research consist of the synthesis and characterization stages. The synthesis stage includes weighing and mixing, calcining, compacting or pelletizing, sintering and annealing. Samples that have gone through the synthesis stage are then characterized using XRD test and resistivity test. The data collected was then analyzed qualitatively and quantitatively. Qualitatively, the data were analyzed using data presentation analysis. While quantitatively the data were analyzed using descriptive statistical data analysis.*

The results of the research on the synthesis and characterization of the YBa2Cu3O7-x superconductor with the addition of Ni doping using the solids reaction method have been successfully carried out so that a black superconducting material is obtained in the form of a pellet with a diameter of 16 mm and a height of 3 mm. Superconducting materials were identified by the Meissner effect on superconducting samples with a magnetic levitation height of ±2mm. The characterization of the superconductors $YBa_2Cu_3O_7$–x *and* $YBa_2Cu_{3-0.1}Ni_{0,1}O_7$–x *was indicated by the XRD test results, namely diffraction peaks were obtained which were then analyzed for hkl values. The resulting crystal structure is Orthorhombic with crystal lattice parameters a= 3,834652 Å, b = 3,876 Å and c = 11,5709 Å for sample* $YBa_2Cu_3O_7$–x. *The sample* $YBa_2Cu_{3-0.1}Ni_{0,1}O_7$–x *shows the crystal lattice parameters a= 3,804 Å, b = 3,906 Å and c = 11,8083 Å. Based on the resistivity test, the calculated temperature and resistivity values were obtained. At resistivity 0.002 there is a transition that causes the critical temperature of each sample to be at a temperature of 91 K for superconductor* $YBa_2Cu_3O_7$–x *and 96 K for superconductor* $YBa_2Cu_{3-0.1}Ni_{0,1}O_7$–x.

Keywords: *Synthesis and characterization,* $YBa_2Cu_3O_7$–x *Superconductor with Ni Doping, and Solid State Reaction Method*