SINTESIS DAN KARAKTERISASI SUPERKONDUKTOR $Y_{1-x}Ni_xBa_2Cu_3O_{7-\delta}$ DENGAN DOPING NIKEL MELALUI METODE REAKSI PADATAN

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ABSTRAK

Penelitian ini bertujuan untuk mensintesisis dan mengkarakterisasi superkonduktor $Y_{1-x}Ni_xBa_2Cu_3O_{7-\delta}$ dengan doping nikel pada atom Y. Superkonduktor merupakan material yang dapat mengalirkan arus tistrik tanpa hambatan ketika didinginkan hingga temperatur kritisnya (Tc), selain itu superkonduktor memiliki sifat diamagnetis sempurna sehingga akan melayang ketika diletakkan di atas magnet. Penelitian ini merupakan penelitian eksperimen eksploratif yang dilaksanakan di Laboratorium Fisika Lanjut Universitas Pendidikan Ganesha. Secara umum riset ini dilaksanakan dalam dua tahap yakni sintesis sampel serta tahap karakterisasi sampel. Terdapat dua sampel yang disintesis yakni sampel tanpa doping (x=0) dan sampel dengan doping nikel (x=0,002) yang disintesis melalui metode reaksi padatan. Didapatkan hasil *latice parameter* dari sampel $YBa_2Cu_3O_{7-\delta}$ yaitu a = 3.8621 Å, b = 3.8638 Å, dan c = 11.7385 Å dengan sudut $\alpha = \beta = \gamma = 90^o$. *Latice parameter* dari sampel $Y_{0,998}Ni_{0,002}Ba_2Cu_3O_{7-\delta}$ yaitu a = 3.8220 Å, b = 3.8898 Å, dan c = 11.6629Å untuk sudut $\alpha = \beta = \gamma = 90^o$. Superkonduktor $Y_{0,998}Ni_{0,002}Ba_2Cu_3O_{7-\delta}$ dengan doping nikel memiliki temperatur kritis 89 K yang lebih tinggi daripada sampel superkonduktor $YBa_2Cu_3O_{7-\delta}$ murni yakni 86 K. Rata-rata ukuran partikel dari sampel superkonduktor $YBa_2Cu_3O_{7-\delta}$ dan sampel Y_1 $Y_{0,998}Ni_{0,002}Ba_2Cu_3O_{7-\delta}$ berturut turut yaitu sebesar 263.263 nm dan 375.108 nm.

Kata kunci: Superkonduktor, reaksi padatan, doping nikel

SYNTHESIS AND CHARACTERIZATION OF $Y_{1-x}Ni_xBa_2Cu_3O_{7-\delta}$ SUPERCONDUCTOR WITH NICKEL DOPING THROUGH SOLID STATE REACTION METHOD

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ABSTRACT

This research aims to synthesize and characterize the $Y_{1-x}Ni_xBa_2Cu_3O_{7-\delta}$ superconductor with nickel doping on the Y atom. Superconductors are materials that can flow electric current without resistance when cooled down to a critical temperature (Tc), besides that superconductors have perfect diamagnetic properties so they will float when placed on a magnet. This research is exploratory experimental research, which was carried out at the Advanced Physics Laboratory of the Ganesha University of Education. In general, this research was carried out in two stages, namely sample synthesis and sample characterization and data analysis stages. There were two samples synthesized, namely the sample without doping (x=0) and the sample with nickel doping (x=0.002) which was synthesized via the solid state reaction method. The lattice parameter results obtained from the $YBa_2Cu_3O_{7-\delta}$ sample are a = 3.8621 Å, b = 3.8638 Å, and c = 11.7385 Å with an angle $\alpha = \beta = \gamma = 90^o$. The lattice parameters of the sample $Y_{0,998}Ni_{0,002}Ba_2Cu_3O_{7-\delta}$ are a = 3.8220 Å, b = 3.8898 Å, and c = 11.6629Å at angle $\alpha = \beta = \gamma = 90^o$. The nickel-doped $Y_{0,998}Ni_{0,002}Ba_2Cu_3O_7$ superconductor has a critical temperature of 89 K which is higher than the pure $YBa_2Cu_3O_{7-\delta}$ superconductor sample, namely 86 K. The average particle size of the $YBa_2Cu_3O_{7-\delta}$ superconductor sample and the $Y_{0,998}Ni_{0,002}Ba_2Cu_3O_7$ superconductor sample is 263,263 nm and 375,108 nm, respectively.

Keyword: *Superconductor, solid state reaction, nickel doping*