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Efek Nanosize Terhadap Sifat Magnetik High-Tc Superconductor La1.80Sr0.20CuO4 = Nanosize Effect on the Magnetic Properties of High-Tc Supercondutor La1.80Sr0.20CuO4

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Abstrak

Material superkonduktor dengan Tc-tinggi La2-xSrxCuO4 dengan x = 0.2 yang masuk ke kategori superkonduktor kuprat disintesis dalam skala nano dengan metode sol-gel. Sampel di-sinter dalam dua durasi yang berbeda (6 jam dan 12 jam) dan tiga suhu yang berbeda (700 C, 800 Cdan 900 C). Dilaksanakan pengujian XRD untuk mengetahui kemurnian fasa dan data untuk Rietveld refinement, yang setelah dilaksanakan ditemukan sampel memiliki space group I4/mmm yang mengindikasikan memiliki struktur kristal tetragonal. Kemudian terlihatnya perubahan parameter sampel seiring suhu meningkat Disugesti disebabkan oleh semakin asimetrisnya kisi seiring ukuran partikel membesar dan karena surface effects dan nanosize effects, serta interaksi superexchange antara Cu-O-Cu yang terganggu. Dilaksanakan uji SEM-EDS untuk menentukan morfologi dan komposisi sampel. Uji VSM dilaksanakan untuk menentukan sifat magnetik di suhu ruangan dan ditemukan semua sampel memperlihatkan sifat feromagnetik, dengan kurva histerisis di sampel ukuran 100 nm memperlihatkan sifat superkonduktivitas, mengindikasikan 100 nm merupakan ukuran perbatasan antara skala nano dan bulk untuk La2-xSrxCuO4.
.....High-Tc superconductor material La2-xSrxCuO4 with x = 0.2 which is categorized as one of the cuprate superconductors is synthesized using sol-gel method. The samples are sintered in two different durations (6 and 12 hours) and three different temperatures (700°C, 800°C and 900°C). XRD analysis is done to determine phase purity and to obtain data to perform Rietveld refinement. The results show the sample has a space group of I4/mmm, indicating tetragonal crystal structure. Shifting values of the lattice constants are also exhibited by the sample. It was suggested to be caused by the increased assymetry of the lattice as particle size increases, more dominant surface effects, nanosize effects and the disruption of the superexchange interaction between Cu-O-Cu. SEM-EDS analysis is also done to determine the morphology and composition of the sample. VSM measurement is performed at room temperature to determine the magnetic properties exhibited by the sample. Further analysis yields results that states all samples are ferromagnetic with the hysteresis curve for the 100 nm sample shows the existence of superconductivity, indicating that 100 nm is the border size between the nanoscale and the bulk scale for La2-xSrxCuO4.