

## Synthesis and characterization of MgB<sub>2</sub>/SiC and MgB<sub>2</sub>/CNT superconductor wire = Sintesis dan karakterisasi kawat superkonduktor MgB<sub>2</sub>/SiC dan MgB<sub>2</sub>/CNT

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### Abstrak

#### **ABSTRACT**

Increasing of superconductor material usage in variety fields of application enforced engineers in making designs of superconductor. Superconductor wires has been applied in Magnetic Resonance Imaging MRI to examine human condition body. MgB<sub>2</sub> superconductor material has the highest T<sub>c</sub> for non Cu Based superconductor, which is at 39 K. One of the ways to synthesized of in situ MgB<sub>2</sub> can be processed using powder in Tube PIT method. In this research, pure MgB<sub>2</sub> was doped with 1 and 2 wt. of each SiC and CNT and sintered at 800oC for 3 hours. The morphology of sintered materials characterized using scanning electron microscope showed the even distribution of the particles with inherent porosities. Structural characterization examined using X ray diffraction showed that there is no other impurities and other or phases detected. Pure MgB<sub>2</sub> and MgB<sub>2</sub> doped with 2 of CNT is a superconductor after being sintered whereas others show unique resistivity behaviors. After deformation by rolling process to form a wire, all of the samples show a superconducting behavior. The presence of SiC and CNT decreased the critical temperature, T<sub>c</sub>, of MgB<sub>2</sub>. Although the sample doped with CNT decreases the T<sub>c</sub>, CNT doped samples has higher T<sub>c</sub> than that of MgB<sub>2</sub> SiC wire.

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Peningkatan penggunaan bahan superkonduktor di berbagai bidang aplikasi memacu para insinyur mendesain superkonduktor. Kawat superkonduktor telah diaplikasikan pada Magnetic Resonance Imaging MRI untuk menggambarkan kondisi tubuh manusia. Bahan superkonduktor MgB<sub>2</sub> memiliki T<sub>c</sub> tertinggi untuk superkonduktor berbasis non-Cu yaitu 39K. Sintesis MgB<sub>2</sub> diproses in-situ berbahan serbuk menggunakan metode Powder in Tube PIT. MgB<sub>2</sub> murni dan penambahan SiC dan CNT dengan berat 1 dan 2 disinter pada 800oC selama 3 jam. Hasil karakterisasi SEM menunjukkan porositas terjadi dan tidak ada fase pengotor dari hasil XRD. Sampel MgB<sub>2</sub> murni dan MgB<sub>2</sub> ditambah dengan 2 CNT menunjukkan sifat superkonduktor setelah disinter sedangkan yang lain menunjukkan perilaku resistivitas yang unik. Setelah dibentuk menjadi kawat, semua sampel menunjukkan perilaku superkonduktor. Penambahan SiC dan CNT pada sampel menurunkan T<sub>c</sub> MgB<sub>2</sub>. Meskipun sampel yang ditambahkan dengan CNT menurunkan T<sub>c</sub>, sampel CNT memiliki T<sub>c</sub> lebih tinggi daripada kawat MgB<sub>2</sub>/SiC.