

Structure and magnetic properties of ni-c nanocomposite

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Abstrak

The synthesis and characterization of nickel-graphite (Ni-C) nanocomposite materials by mechanical milling method have been performed. This composite was prepared by mixing high purity nickel and graphite. The mixture was milled for 25, 50, and 75 hours and then was compacted at pressure of 5000 psi. The samples consist of two phases, namely carbon and nickel phases. Carbon phase has hexagonal structure, space group: P 63 m c (186), lattice parameters of $a = b = 2.352(1) \text{ \AA}$ and $c = 6.669(7) \text{ \AA}$, $\alpha = \beta = 90^\circ$ and $\gamma = 120^\circ$, $V = 31.9(7) \text{ \AA}^3$ and $\rho = 5.585 \text{ gr.cm}^{-3}$. Nickel phase has cubic structure, space group: F m $\bar{3}$ m (225), lattice parameters of $a = b = c = 3.5254(7) \text{ \AA}$, $\alpha = \beta = \gamma = 90^\circ$, $V = 43.81(2) \text{ \AA}^3$ and $\rho = 8.898 \text{ gr.cm}^{-3}$. The calculation results show that the crystallite size of the Ni-C75 sample was around 3.83 nm. The Ni-C75 sample is also suspected to have grown embryo of carbon nanotube (CNT) due to the presence of nickel. The hysteresis loop of the sample consists of intrinsic saturation M_s , remanence M_r , and coercivity H_c are 1.40 emu/gr, 0.28 emu/gr, and 128 Oe, respectively. The value of MR is about 28% at 7.5 kOe magnetic field. The sample shows magnetoresistance behavior and the phenomenon of sensor characteristics. We concluded that this study has successfully made Ni-C nanocomposite and it is expected that the nano composite Ni-C is able to be used for sensor material application.