

ABSTRACT

Name : Rusman
Studies Program : Physics
Title : *Development of Curie Temperature Measurement Method (T_c) in Ferromagnetic Materials Using a Smartphone Magnetometer*

Curie temperature research shows that the critical temperature of the ferromagnetic phase transition of a solid material becomes paramagnetic due to heating, Curie temperature has been successfully measured using a smartphone magnetometer and calculated using the mathematical mean field theory (MFT) approach. The purpose of this study is to determine the temperature of Curie using the development of a measuring device consisting of a permanent magnet, a material that can change the temperature of a permanent magnet, a thermometer, and a smartphone magnetometer. A permanent magnet with a thermometer is glued and placed on a glass which the smartphone magnetometer is placed next to the glass. When the temperature is lowered or raised to naturally return to room temperature, the smartphone magnetometer will measure the value of the magnetic field to temperatures in the range $0, 2 - 0, 4^{\circ}\text{C}$. The relationship between magnetic field value and temperature was analyzed using linear fittings, and Curie temperature results showed for neodymium, ferrite and iron magnets of $625, 7\text{K}$ ($352, 6^{\circ}\text{C}$), $576, 7\text{K}$ ($303, 6^{\circ}\text{C}$), and $1052, 2\text{K}$ ($778, 9^{\circ}\text{C}$), then the experiment was conducted several times and the results were in accordance with the references for neodymium magnets ($583 - 673\text{K}$), ferit (MnFe_2O_4 , 573K), and iron (1043K).

Keyword: *Temperature Curie, permanent magnet, smartphone magnetometer, thermometer, MFT*

ABSTRAK

Nama : Rusman
Program Studi : Fisika
Judul : Pengembangan Metode Pengukuran Suhu *Curie* (T_C) pada Bahan Feromagnetik Menggunakan *Smartphone* Magnetometer

Penelitian suhu *Curie* menunjukkan bahwa suhu kritis terjadinya transisi fase feromagnetik suatu bahan padat menjadi paramagnetik akibat pemanasan, suhu *Curie* telah berhasil diukur menggunakan *smartphone* magnetometer dan dihitung menggunakan pendekatan matematis *mean field theory* (MFT). Tujuan dari penelitian ini yaitu menentukan suhu *Curie* menggunakan pengembangan alat ukur yang terdiri dari magnet permanen, material yang bisa merubah suhu magnet permanen, termometer, dan *smartphone* magnetometer. Magnet permanen dengan termometer direkatkan dan ditempatkan pada gelas yang kemudian dipasang *smartphone* magnetometer di samping gelas. Ketika suhu diturunkan atau dinaikan hingga kembali secara alamiah ke suhu ruang, *smartphone* magnetometer akan mengukur nilai medan magnet terhadap suhu dalam rentang $0,2 - 0,4^\circ C$. Hubungan antara nilai medan magnet dengan suhu dianalisis menggunakan *fitting linier*, dan hasil suhu *Curie* menunjukkan untuk magnet neodmium, ferit dan iron sebesar $625,7K (352,6^\circ C)$, $576,7K (303,6^\circ C)$, dan $1052,2K (778,9^\circ C)$, kemudian penelitian dilakukan beberapa kali percobaan dan hasilnya sesuai dengan referensi untuk magnet neodmium ($583 - 673K$), ferit ($MnFe_2O_4$, $576K$), dan iron ($1043K$).

Kata Kunci: Suhu *Curie*, termometer, magnet permanen, *smartphone* magnetometer, MFT