



## INTISARI

### **Desain dan Pengembangan Koyo Elektromagnetik untuk Jari-Jemari Manusia**

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Telah dilakukan desain, pengembangan, dan karakterisasi sistem koyo elektromagnetik khusus untuk sampel uji jari-jemari manusia. Penelitian ini bertujuan pemanfaatan prinsip elektromagnetik dan hipertermia diterapkan dalam perancangan dan pengembangan koyo elektromagnetik untuk terapi jari-jemari manusia. Metode penelitian dibagi menjadi empat tahap. Pertama, desain alat koyo elektromagnetik digunakan koil dengan variasi jumlah lilitan (500, 1.000, dan 1.500) serta arus listrik AC frekuensi PLN (50 Hz). Kedua, karakterisasi digunakan tabung berisi 28 mL air, dengan suhu air diukur setiap menit selama 10 menit untuk mencapai laju pemanasan  $0,5^{\circ}\text{C}$  per menit. Ketiga, karakterisasi dengan variasi larutan (tabung kosong, larutan gula, larutan garam, dan minyak), dipilih jumlah koil lilitan dan arus yang paling efektif. Keempat, pengujian pada 10 jari, masing-masing selama 10 menit. Diperoleh hasil sebuah sistem koyo elektromagnetik, komponen utama berupa koil dengan jumlah lilitan 1.500 (panjang 9,8 cm, diameter 4,6 cm) berarus  $(2,5 \pm 0,1)$  A. Sistem ini memberikan kenaikan suhu  $(5 \pm 0,1)$   $^{\circ}\text{C}$  pada bahan uji air dalam selang waktu 10 menit. Dengan demikian, penelitian ini telah dikembangkan koyo elektromagnetik yang efektif minimalisir rasa nyeri pada jari-jemari manusia dengan efek pemanasan.

Kata kunci: desain dan pengembangan, koyo elektromagnetik, koil, hipertermia, jari-jemari.



## ABSTRACT

### **Design and Development of Electromagnetic Therapy Patches for Human Fingers**

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The design, development, and characterization of a specialized electromagnetic patch system for human finger samples have been conducted. This study aims to utilize electromagnetic principles and hyperthermia in the design and development of electromagnetic patches for human finger therapy. The research method is divided into four stages. First, the design of the electromagnetic patch device uses coils with varying numbers of windings (500, 1,000, and 1,500) and AC electrical current at the utility frequency (50 Hz). Second, characterization uses a tube containing 28 mL of water, with the water temperature measured every minute for 10 minutes to achieve a heating rate of 0.5°C per minute. Third, characterization was performed with varying solutions (empty tube, sugar solution, salt solution, and oil), selecting the most effective number of coil windings and current. Fourth, testing was conducted on 10 fingers, each for 10 minutes. The results obtained were an electromagnetic patch system, with the main component being a coil with 1,500 windings (length 9.8 cm, diameter 4.6 cm) and a current of  $(2,5 \pm 0,1)$  A. This system caused a temperature increase of  $(5 \pm 0,1)$  °C in the water test material over a 10-minute period. As a result, this study has developed an effective electromagnetic patch that minimizes pain in human fingers through a heating effect.

Keywords: design and development, electromagnetic patch, coil, hyperthermia, fingers.