ABSTRAK

Peningkatan signifikan pemanfaatan frekuensi gelombang mikro khususnya bidang komunikasi berdampak buruk terhadap gangguan kinerja alat-alat elektronik. Permasalahan ini mendorong adanya pengembangan teknologi untuk mengurangi paparan gelombang mikro dengan suatu material berbahan magnetik yaitu penyerap gelombang mikro. Penelitian ini bertujuan untuk mengetahui karakterisasi penyerapan gelombang mikro berbahan dasar barium ferit dengan *doping* biosilika dari abu sekam padi konsentrasi sebesar 20 (*weight*%), dengan variasi temperature *sintering* 800, 900, 1.000, dan 1.100 °C. Material dibuat menggunakan metode *modified solid state reaction*, yang merupakan penggabungan dari metode *novel water assisted* dengan metode *solid state reaction*. Kenaikan temperatur *sintering* memengaruhi struktur kristalin, sifat magnetik, dan daya serap gelombang. Hasil XRD menunjukkan beberapa struktur kristal seperti $Ba_2Fe_{24}O_{38}$ dengan struktur *hexagonal*, Fe_2O_3 *rhombohedral*, $Fe_{16}O_{20}$ *orthorombic*, $Si_{96}O_{192}$ *cubic*, $Ba_4Fe_4Si_{16}O_{40}$ *tetragonal*, Si_4O_8 *tetragonal*, Si_8O_{16} *orthorombic*, $Ba_6Fe_{90}O_{138}$ *hexagonal* dengan ukuran rata-rata kristal yang cenderung semakin besar berkisar antara 51,84 - 58,01 nm. Hasil VSM menunjukkan material SiBaFe bersifat *soft magnetic*. Sampel dengan kode SiBaFe-1 termasuk dalam tipe material paramagnetik dengan orde 10^{-5}, sementara sampel SiBaFe-2, SiBaFe-3, dan SiBaFe-4 termasuk ke dalam tipe superparamagnetik. Hasil VNA menunjukkan sampel SiBaFe dengan penyerapan gelombang mikro terbesar terdapat pada sampel SiBaFe-4 yang diberi perlakuan perlakuan suhu *sinteringing* 1.100 °C, dengan nilai *reflection loss* (R_L) sebesar -17,87 dB dan persentase penyerapan sebesar 96,98%.

Kata Kunci: penyerap gelombang mikro, biosilika, barium ferit, *modified solid state reaction*

ABSTRACT

The significant increase in the use of microwave frequencies, especially in communication field, has a negative impact on electronic device performance. This issue contributed to the development of technology to reduce exposure of microwaves with a magnetic material, a microwave absorber. This study aims to determine the characterization of microwave absorption made from barium ferrite with biosilica as dopan at concentration of 20 (weight%), with sintering temperature variations of 800, 900, 1.000, and 1.100 °C. The material was made using modified solid state reaction method, which is a combination between novel water assisted method and solid state reaction method. The increase in sintering temperature affects crystalline structures, magnetic properties, and wave absorption. XRD results showed several crystal structures such as $Ba_2Fe_{24}O_{38}$ with hexagonal structure, Fe_2O_3 rhombohedral, $Fe_{16}O_{20}$ orthorhombic, $Si_{96}O_{192}$ cubic, $Ba_4Fe_4Si_{16}O_{40}$ tetragonal, Si_4O_8 tetragonal, Si_8O_{16} orthorhombic, $Ba_6Fe_{90}O_{138}$ hexagonal with an average crystal size range from 51,84 – 58,01 nm. VSM results showed that SiBaFe material is soft magnetic. SiBaFe-1 belong to paramagnetic material type with order 10^{-5}, while SiBaFe-2, SiBaFe-3, and SiBaFe-4 belong to superparamagnetic type material. VNA results showed that SiBaFe sample with the largest absorption of microwaves was found in SiBaFe-4 with sintering temperature of 1100 °C, with value of reflection loss (RL) -17,87 dB and absorption percentage of 96.98%.

Keywords: *microwave adsorbent, biosilica, barium ferrite, modified solid state reaction*