Magnetic and microwave absorption characteristics of ti2+-mn4+ substituted barium hexaferrite

Azwar Manaf, author

Abstrak

Series of Ti2+-Mn4+ ions substituted BaFe12-2xTixMnxO19 samples with x = 0.0–0.8 have been studied to find out the effect of ion substitution on their microstructure, magnetic, and microwave absorption characteristics. The materials were synthesized through the mechanical alloying process. X-ray diffraction pattern for all sintered samples confirmed that the materials are single phase materials with BaFe12O19 structure. Referring to the results, it is shown that all samples that are subject to ultrasonic irradiation treatment characterized by a crystallite size distribution with the width get slimmer and mean crystallite size get smaller as the substitution level increased from x = 0 to x = 0.8. A sample of latter composition has fine crystals between 10–200 nm with the mean size of 42 nm. The effect of ionic substitution also affected the magnetic properties in which coercivity decreased proportionally with an increase of x value. The saturation magnetization increased to 0.41 T at x = 0.4, and then decreased for higher x values. Hence, the increase occurred only in samples with low-level substitutions of Ti2+-Mn4+ ions. Microwave absorption characterization clearly shows that the reflection loss (RL) value of Ti2+-Mn4+ substituted BaFe12-2xTixMnxO19 samples was enhanced from 2.5 dB in a doped free sample (x = 0) to 22 dB (~92% absorption) in a sample with x = 0.6 in the frequency range 8–12 GHz.