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Characterizations of ceramic magnets from iron sand

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Abstrak

Ceramic magnets with the chemical composition of barium hexaferrite (BaFe12O19) were obtained through the synthesis of magnetite powder from iron sand taken from the Southern Coast of Yogyakarta in Indonesia. The iron sand was dissolved and then synthesized to produce magnetite powder. Subsequently, the magnetite powder was oxidized at temperatures of 700, 900, and 1100°C for five hours to produce hematite. The un-oxidized magnetite and the magnetite which was oxidized at the different temperatures were each mixed with barium carbonate, respectively. The mixtures were then calcined at 1100°C for two hours. The calcined products were compacted and then sintered at 1100°C for one hour to produce sintered ceramic magnets. X-ray diffraction (XRD), a vibrating sample magnetometer (VSM), a scanning electron microscope (SEM) with an energy dispersive X-ray spectroscope (EDS), and thermogravimetry analysis (TGA) were used to characterize the ceramic magnets. The results showed the magnetite that was directly calcined, compacted, and sintered had a BaFe12O19 phase and also had the presence of a Fe2O3 phase with a BH(max) of 0.26 MGOe, Hc of 1.27 kOe, and Ms of 31.421 emu/g. The sintered ceramic magnet which was initially oxidized at a temperature of 900°C had a BaFe12O19 phase with a BH(max) of 0.78 MGOe, Hc of 1.95 kOe, and Ms of 46.970 emu/g. These results indicate satisfactory results as a permanent magnet. Thus, the iron sand from the Southern Coast of Yogyakarta in Indonesia has potential for the production of ceramic permanent magnets.