

## **ABSTRACT**

Barium hexaferrite ( $\text{BaFe}_{12}\text{O}_{19}$ ) is a ceramic magnetic material with hard characteristics and is used in various components of high-frequency equipment.  $\text{BaFe}_{12}\text{O}_{19}$  is a promising magnetic material. To produce  $\text{BaFe}_{12}\text{O}_{19}$  of good quality, it is necessary to adjust the shape, purity of precursor materials, surface area, and synthesis procedures.  $\text{BaFe}_{12}\text{O}_{19}$  was produced using the hydrothermal synthesis method. This study aims to obtain the results of thermal characterization and particle size of  $\text{BaFe}_{12}\text{O}_{19}$ . Thermal characterization was performed using TGA and DSC, and particle size analysis using PSA.  $\text{BaFe}_{12}\text{O}_{19}$  were synthesized from  $\text{Ba}(\text{NO}_3)_2$ ,  $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$ , and NaOH using the hydrothermal method at a temperature of  $180^\circ\text{C}$  for 8 hours in an autoclave, which produced the main phase in the form of dry powder. The results of the particle samples characterized by TGA and DSC were analyzed by comparing the DTG graph, or the first derivative of the TGA value, which showed the process of water decomposition, nitrate decomposition, oxygen adsorption, and crystallization of  $\text{BaFe}_{12}\text{O}_{19}$ . The  $\text{BaFe}_{12}\text{O}_{19}$  phase formation process was observed by TGA and DTG at a temperature between  $670^\circ\text{C}$  and  $900^\circ\text{C}$  with an oxidation reaction. An intermediate phase of  $\text{BaFe}_2\text{O}_4$  is formed during the formation of  $\text{BaFe}_{12}\text{O}_{19}$  followed by the crystallization of pure  $\text{BaFe}_{12}\text{O}_{19}$ . The formation of  $\text{BaFe}_{12}\text{O}_{19}$  was confirmed in the DSC characterization analysis, which showed the formation of an intermediate phase of  $\text{BaFe}_2\text{O}_4$  at the exothermic peak temperature of  $580^\circ\text{C}$ . The crystalline formation of  $\text{BaFe}_{12}\text{O}_{19}$  at a temperature of more than  $728^\circ\text{C}$ . The results using PSA showed that the grain size of  $\text{BaFe}_{12}\text{O}_{19}$  was micrometers with an average particle size was  $44,102 \mu\text{m}$ .

**Keywords :** *BaFe<sub>12</sub>O<sub>19</sub>, hydrothermal, thermal characterization, particle size*