Simple Process Synthesis and Magnetoresistance of BaTiO$_3$–Fe$_3$O$_4$ Ceramic Composite

K. Kamishima, R. Awata, T. Noshiro, K. Kakizaki, A. Fujimori, M. Sakai, K. Watanabe$^a$

*Saitama University, Saitama 338-8570, Japan*

$^a$RIKEN, Wako 351-0198, Japan

kamisima@fms.saitama-u.ac.jp

Ceramic composites (xBaTiO$_3$-(1-x)Fe$_3$O$_4$) were successfully prepared by a direct solid state reaction of raw materials (BaCO$_3$, Fe$_3$O$_4$, and TiO$_2$) [1]. X-ray diffraction (XRD) and electron probe micro analysis (EPMA) measurements were performed for these samples and it is confirmed that the composites consist of Fe$_3$O$_4$ and BaTiO$_3$ phases. The saturation magnetization ($M_S$) decreased linearly with increasing x, which was consistent with the product of the molar fraction of Fe$_3$O$_4$ and the $M_S$ of pure Fe$_3$O$_4$. A large MR ratio of 5.1% was observed for the $x = 0.05$ sample. The MR ratio is four times as large as that of the Fe$_3$O$_4$ powder compact [2]. This result suggests that the formation of insulating BaTiO$_3$ barriers and tunneling conduction of spins between Fe$_3$O$_4$ grains causes the large MR ratio in this BaTiO$_3$-Fe$_3$O$_4$ system.


![Fig. 1 M-H and R-H curves of 0.05BaTiO$_3$-0.95Fe$_3$O$_4$ at room temperature.](attachment.png)