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## Study of magnetic structure and electrical-transport properties of $\text{La}_{1-y}\text{Ba}_y\text{Mn}_{1-x}\text{Fe}_x\text{O}_3$ ( $y = 0.15, 0.40$ ) perovskite manganites

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An O 2p itinerant-electron model for magnetic oxides, which is similar to the O 2p hole-carrier model proposed by Alexandrov et al. [Phys. Rev. Lett. 96 (2006) 117003], was used to explain the magnetic and electrical-transport properties of two series of samples with the nominal composition  $\text{La}_{1-y}\text{Ba}_y\text{Mn}_{1-x}\text{Fe}_x\text{O}_3$  ( $0.00 \leq x \leq 0.20$ ;  $y = 0.15, 0.40$ ). The samples were prepared using the sol-gel method, and X-ray diffraction patterns showed that all samples were single-phase  $\text{ABO}_3$  perovskite structures. The magnetic and electrical-transport properties of the samples were characterized. Interesting phenomena were observed for the magnetic moment,  $\mu_{\text{obs}}$ , of the samples at 10 K:  $\mu_{\text{obs}}$  of the samples with  $y = 0.15$  decreased approximately linearly when the Fe-doping level was increased from zero to  $x = 0.2$ . However, there was a characteristic Fe-doping level,  $x_C = 0.10$ , for the samples with  $y = 0.40$ . When  $x \leq x_C$ ,  $\mu_{\text{obs}}$  decreased very slowly; when  $x > x_C$ ,  $\mu_{\text{obs}}$  decreased rapidly. These interesting phenomena suggest that the samples had a canted magnetic structure, but the cant angle of the samples with  $y = 0.15$  was smaller than that of the samples with  $y = 0.40$ . These magnetic structures were further confirmed by the electrical-transport properties of the samples.

**Keywords:** Perovskite manganite; Crystal structure; Magnetic properties; Electrical transport properties; Magnetoresistance effect.

### 1. Introduction

The  $\text{ABO}_3$  perovskite manganites  $\text{Re}_{1-x}\text{Ae}_x\text{MnO}_3$  have received much attention in

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