Temperature Dependent Ultrasonic Velocity and Attenuation in $Sm_{0.67}Sr_{0.33}MnO_3$ Perovskite

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ABSTRACT

In order to investigate the metal-insulator (M-I) transition and structural transition, ultrasonic velocity and attenuation measurements have been made at 5 MHz in $Sm_{0.67}Sr_{0.33}MnO_3$ perovskite manganite material in the temperature range of 120 to 300 K. A sudden drop in the velocity and an increase in the attenuation at $T_C \sim 140$ K are attributed to the transition from ferromagnetic (FM) to canted ferromagnetic (CFM) state. A dramatic decrease in the velocity and a sudden increase in the attenuation below the T_C is ascribed to a strong magnetic scattering detected in the canted ferromagnetic insulating state and the existence of the magnetic two phase state (MTPS). The ultrasonic results also indicate that Jahn-Teller transition temperature (T_{JT}) is close to 170 K. The presence of T_C and T_{JT} are due to the existence of strong electron-phonon interaction, which arises due to the Jahn-Teller effect and spin-phonon interaction due to linear magnetostriction effect.

Keywords: Perovskite manganite, Ultrasonic velocity, attenuation, Magnetic two phase state

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Materials Processing for Properties and Performance (MP^3) Vol. 3
Edited by K.A. Khor, R. V. Ramanujan, C. P. Ooi and J. H. Zhao
Institute of Materials East Asia, 2004