

UNIVERSITI TEKNOLOGI MARA

**STRUCTURAL, ELECTRICAL,
MAGNETIC PROPERTIES AND
ELECTRORESISTANCE EFFECT OF
 $\text{La}_{0.7}\text{Ba}_{0.3}\text{Mn}_{1-x}\text{M}_x\text{O}_3$
($\text{M} = \text{Fe}^{3+}, \text{Mo}^{6+}; x = 0, 0.01, 0.02, 0.03,$
0.04) DOPED MANGANITES**

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ABSTRACT

The structural, electrical and magnetic properties and electroresistance (ER) effect in $\text{La}_{0.7}\text{Ba}_{0.3}\text{Mn}_{1-x}\text{M}_x\text{O}_3$ ($\text{M} = \text{Fe}^{3+}, \text{Mo}^{6+}; x = 0 - 0.04$) prepared by using solid state method have been studied. An analysis of X-ray diffraction data using Rietveld refinement method showed all samples crystallized in rhombohedral $R\text{-}3c$ structural and are in single phased except for Mo substituted samples ($x \geq 0.02$). Substitution of Fe cause small changes in unit cell volume indicates the substitution of Fe not much influence on lattice distortion. Contrary to that, Mo substitution at Mn site in $\text{La}_{0.7}\text{Ba}_{0.3}\text{Mn}_{1-x}\text{Mo}_x\text{O}_3$ causes increase in unit cell volume except for $x = 0.02$ indicate the occurrence of lattice distortion in the system. From p vs T curves shown that both Fe and Mo substitution increased the resistivity in the temperature range of 20 K - 300 K under applied current of 10mA and exhibit decreased in resistivity under applied current of 20mA. The observed behaviour indicates enhancements of conduction itinerant electrons and weakened electron-lattice interactions, in the metallic and insulating regions, respectively. Both Fe and Mo substituted samples exhibit larger value of ER effect compared to $x = 0$ at low temperature region which may be related to formation of more conduction filamentary path induced by magnetic inhomogeneity under higher applied current. In insulating region, the low value of ER effect in all substituted samples may related to enhancement of localization of charge carrier. Both Fe and Mo substitution increased the scattering effect indicates by the increased of scattering parameters while high applied current reduced the effects in metallic region. In the insulating region, the observed resistivity behaviour can be explained by small polaron hopping, SPH process. Both Fe and Mo substitution increased the electron-lattice attraction as hopping energy, E_a values are larger in the Fe and Mo substituted samples as compared to $x = 0$ sample whereas the electron-lattice attraction weakened under applied current of 20mA. The observed nearly constant ER effect in Mo substituted samples indicates high stability of the sample in wide temperature range which suitable for next generation of electronic device.

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