

ELECTRONIC STATES OF COLLOSAL MAGNETORESISTIVE MANGANITES $\text{La}_{0.67}\text{Pb}_{0.33}\text{Mn}_{1-x}\text{Fe}_x\text{O}_3$ FROM PHOTOEMISSION SPECTROSCOPY

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Keywords: manganites, photoemission, electronic states

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The electron photoemission spectra of the valence bands and the core level states of manganese perovskite $\text{La}_{0.67}\text{Pb}_{0.33}(\text{Mn}_{1-x}\text{Fe}_x)\text{O}_3$ with $x = 0, 0.01, 0.03, 0.06, 0.1$ and 0.15 were measured by the Ultraviolet and the X-ray Photoemission Spectroscopy (UPS/XPS) below and above the metal-insulator transition. X-ray diffraction showed that the compounds were phase pure. The magnetic and resistance measurements exhibited the large colossal magnetoresistance behaviour around the metal – insulator transitions. The common feature of the UPS spectra was the two-peak structure at about -4.0 and -6 eV below the upper edge of the valence band (Fig. 1). The same was observed in Refs. [1, 2].

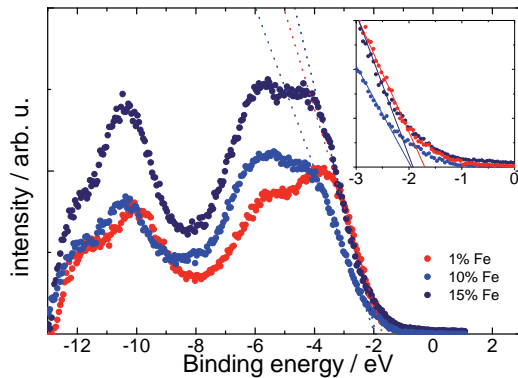


Figure 1. UPS spectra of $\text{La}_{0.66}\text{Pb}_{0.33}\text{Mn}_{1-x}\text{Fe}_x\text{O}_3$ for $x = 0.01, 0.1, 0.15$ at room temperature.

The insulating energy gaps were estimated at room temperature to be about $1.7\div 2.0$ eV and were composition dependent. Total energy scan and low binding energy spectra of X-ray (XPS- Al, Mg $K\alpha$) as well as the Mn $2p$ - and $3s$ - core-level spectra were also measured and analyzed (Fig. 2). Comparison of the spectra with the band structure calculations and with the high-resolution spectra measured at synchrotron radiation for Ca- and Ce- substituted manganites [3, 4] revealed the strong hybridization of the Mn $3d$ and of the O $2p$ states between -3 and -7 eV and no oxygen states between 0 and -2 eV where the Mn- $3d$ states play predominant role. Reasons for this behaviour were

discussed taking into account our previous analysis of UPS/XPS spectra of other manganese perovskites [1, 2].

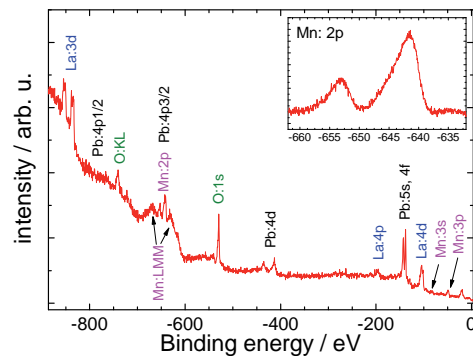


Figure 2. The total X-ray (Mg, $K\alpha$) spectra of $\text{La}_{0.66}\text{Pb}_{0.33}\text{MnO}_3$ with the core-level and Auger lines indicated at room temperature. Inset: the Mn $2p$ core-level spectrum taken with Al- $K\alpha$ without background.

Acknowledgements: The samples were prepared within the collaboration with Professor Gritzner group from the Kepler University in Linz, Austria. This was supported by the Faculty of Physics and Applied Computer Science, AGH University of Science and Technology, Cracow, Poland.

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