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Spin blockade, orbital occupation, and charge ordering in $La_{1.5}Sr_{0.5}CoO_4$ CHUN-FU CHANG, II.Physikalisches Institut, Universität zu Köln, ZHIWEI HU, MPI für Chemical Physik fester Stoffe, Dresden, HUA WU, TOBIAS BURNUS, NILS HOLLMANN, THOMAS LORENZ, II.Physikalisches Institut, Universität zu Köln, ARATA TANAKA, Department of Quantum Matter, Hiroshima University, HONG-JI LIN, CHIEN-TE CHEN, National Synchrotron Radiation Research Center, Taiwan, LIU HAO TJENG, MPI für Chemical Physik fester Stoffe, Dresden — Using Co-$L_{2,3}$ and O-K x-ray absorption spectroscopy, we reveal that the charge ordering in $La_{1.5}Sr_{0.5}CoO_4$ involves high spin (S=3/2) Co^{2+} and low spin (S=0) Co^{3+} ions. This provides evidence for the spin blockade phenomenon as a source for the extremely insulating nature of the $La_{2-x}Sr_xCoO_4$ series. The associated e_g^2 and e_g^0 orbital occupation accounts for the large contrast in the Co-O bond lengths and, in turn, the high charge ordering temperature. Yet, the low magnetic ordering temperature is naturally explained by the presence of the non-magnetic (S=0) Co^{3+} ions. From the identification of the bands we infer that $La_{1.5}Sr_{0.5}CoO_4$ is a narrow band material.

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