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X-ray absorption and x-ray magnetic dichroism study on Ca_3CoRhO_6 and Ca_3FeRhO_6 TOBIAS BURNUS, ZHIWEI HU, University of Cologne, Germany, JULIO C. CEZAR, European Synchrotron Radiation Facility, Greoble, France, SEIJI NIITAKA, RIKEN and CREST, Saitama, Japan, HUA WU, University of Cologne, HIDENORI TAKAGI, RIKEN and CREST, Saitama, Japan and University of Tokyo, Japan, CHUN FU CHANG, University of Cologne, NICHOLAS B. BROOKES, European Synchrotron Radiation Facility, Greoble, France, LING-YUN JANG, KENG S. LIANG, National Synchrotron Radiation Reasearch Center, Hsinchu, Taiwan, L. HAO TJENG, University of Cologne, Germany — The valence-state of the transition-metal ions in the chain-like compounds Ca_3CoRhO_6 and Ca_3FeRhO_6 is currently an issue under debate. Using numerical simulations and x-ray absorption spectroscopy at the Rh-$L_{2,3}$, the Co-$L_{2,3}$, and the Fe-$L_{2,3}$ edges we reveal a Co^{2+}/Rh^{4+} configuration in Ca_3CoRhO_6 and Fe^{3+}/Rh^{3+} in Ca_3FeRhO_6. X-ray magnetic circular dichroism at the Co-$L_{2,3}$ edge shows that the Co^{2+} ions carry a giant orbital moment of about $1.7\mu_B$. We attribute this to a $d_1^0 d_1^2$ ground state for the high-spin Co $3d^7$ configuration in trigonal prismatic coordination. The intrachain-ferromagnetic coupling of two neighboring Co ions is mediated by a low-spin Rh^{4+} ion ($S = 1/2$) in between. The results agree with our recent ab-initio study [Hua Wu *et al.*, Phys. Rev. B **75**, 245118 (2007)].

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