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Polarization dependent X-ray absorption and resonant inelastic X-ray scattering studies at Cu K-edge in quasi-one-dimensional cuprate LiCu_2O_2 single crystals KU-DING TSUEI, CHENG-MAU CHENG, National Synchrotron Radiation Research Center, Hsinchu, Taiwan, ROC, CHIA-WEI HU, National Tsing Hua University, Hsinchu, Taiwan, ROC, KUO WEI YEH, MAU-KUEN WU, Institute of Physics, Academia Sinica, Taipei, Taiwan, R.O.C. — We have carried out a polarization dependent X-ray absorption (XAS) and the resonant inelastic X-ray scattering (RIXS) experiments on LiCu_2O_2 single crystals near the Cu K-edge. The XAS measurement reveals absorption peaks associated with Cu^+ and Cu^{2+} $4p$ unoccupied states respectively. A pre-edge peak can be assigned to quadrupole transition at the Cu^{2+} site. In the RIXS measurement, the incident energy dependent spectra disclose three energy loss peaks at 3.6 eV, 6.1 eV and 4.9 eV. The energy loss of 3.6 eV and 6.1 eV are the charge transfer states from O $2p$ nonbonding and bonding states to the Cu^{2+} $3d$ states and resonate at two incident energies. The third peak at 4.9 eV can be associated with Cu^+ $4p_{x,y}$; we argue that this feature is generated by the Cu^+ $3d$ state coupled with Cu^{2+} $3d$ state through the shared O $2p$ bonding. In addition, the 3.6 eV and 6.1 eV energy loss peaks are nearly dispersionless in momentum dependent spectra.

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