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Electronic structure of Fe_3O_4 revealed by RIXS HSIAO-YU HUANG, Doctor Program of Science and Technology of Synchrotron Light Source, National Tsing Hua University, Hsinchu 30013, Taiwan, RU-PAN WANG, Department of Chemistry, Utrecht University, Utrecht, Netherlands, WEN-BIN WU, CHIA-HUNG LAI, HOK-SUM FUNG, CHIEN-TE CHEN, National Synchrotron Radiation Research Center, Hsinchu 30076, Taiwan, JIANSHI ZHOU, Department of Mechanical Engineering, Texas Material Institute, The University of Texas at Austin, Texas 78712, USA, FRANK DE GROOT, Department of Chemistry, Utrecht University, Utrecht, Netherlands, DI-JING HUANG, National Synchrotron Radiation Research Center, Hsinchu 30076, Taiwan — Magnetite (Fe_3O_4) is a prototypical example of a mixed valence compound. At 125 K, Fe_3O_4 undergoes the Verwey transition associated with charge ordering. The valence electrons order themselves over the octahedral sites (B sites) to form a Fe^{2+} and Fe^{3+} superstructure in the insulating phase below the transition temperature. Here we report measurements of resonant inelastic soft X-ray scattering (RIXS) to unravel the electronic structures of Fe_3O_4. By the advantage of high energy-resolution ($\Delta E \approx 80$ meV) of the RIXS spectra, we found two distinctive features of magnetic excitations, coming from octahedral Fe^{2+} and Fe^{3+} separately. These magnetic excitations are described well by a local ionic model. The *dd* excitations of the different Fe sites are also revealed in the RIXS spectra.

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