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Valence values of the cations in selenospinel $\text{Cu}(\text{Cr},\text{Ti})_2\text{Se}_4$ ¹ HAN-JIN NOH, S.-W. HAN, S.-J. OH, Center for Strongly Correlated Materials Research, Seoul National University, Seoul, Korea, J.-S. KANG, S. S. LEE, G. KIM, Dep. of Phys. The Catholic University of Korea, Puchon, Korea, J.-Y. KIM, H.-G. LEE, Pohang Accelerator Laboratory, Pohang, Korea, S. YEO, S.-W. CHEONG, Dep. of Phys. & Astro. Rutgers University, NJ — A long-standing issue about the Cu valency in selenospinel CuCr_2Se_4 was investigated by soft x-ray absorption spectroscopy (XAS) and magnetic circular dichroism (XMCD). Using the sensitivity of XAS and XMCD to the valence value of transition metal ion and its local symmetry, we checked the valence value of each cation in selenospinel $\text{CuCr}_x\text{Ti}_{2-x}\text{Se}_4$ ($x = 1.0, 1.1, 1.5, \text{ and } 2.0$) and obtained spectroscopic evidence that a small amount of the Cu cation changes the valency from Cu(I) to Cu(II) as the Cr concentration increases from 1.0 to 2.0. Dependence of the Cu(II) concentration and the mean field magnetic exchange energy on the Cr concentration suggests the Cu d -hole plays a crucial role in the intriguing magnetic/electrical properties of CuCr_2Se_4 .

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