

Electronic States of Half-Metallic Chromium Oxides Proved by ^{53}Cr NMR

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Half-metallic chromium oxides with high-valence chromium ions attract new interests from the aspect of unusual electronic states, which lead to fascinating physical properties, in $3d$ transition metal oxides with the negative charge transfer. Recently, $\text{K}_2\text{Cr}_8\text{O}_{16}$ was reported to undergo an unusual transition from a half metal to an insulator at 95 K in the ferromagnetic phase below 180 K.¹ The ferromagnetic half-metallic state may be closely related to the electronic state as theoretically discussed on the half metal CrO_2 .² However, the electronic state of these chromium oxides remains an open issue. In this study, we have performed ^{53}Cr NMR measurements to clarify the local electronic state of $\text{K}_2\text{Cr}_8\text{O}_{16}$ and CrO_2 . In the ferromagnetic metal phase of both chromium oxides, we observed ^{53}Cr NMR spectra coming from several chromium sites which are inconsistent with one chromium site on tetragonal lattice, the hollandite structure (symmetry $I4/m$) of $\text{K}_2\text{Cr}_8\text{O}_{16}$ and the rutile structure ($P4_2mnm$) of CrO_2 . This anomalous electronic state is discussed with the metal-insulator transition in $\text{K}_2\text{Cr}_8\text{O}_{16}$.

¹K. Hasegawa *et al.*, Phys. Rev. Lett. **103**, 146403 (2009).

²M. A. Korotin *et al.*, Phys. Rev. Lett. **80**, 4305 (1998).