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Magnetic ground state of rutile-type oxide RuO_2 inferred from muon

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Ruthenium dioxide RuO_2 is a well-known catalyst applied in various fields due to its high electrical conductivity and chemical stability. Although rutile RuO_2 has long been regarded as a Pauli paramagnetic metal, recent neutron diffraction experiments and resonant X-ray scattering have suggested the presence of an antiferromagnetic order ($T_N > 300$ K: Ru moment size $\sim$0.05 μ_B) associated with the lattice distortion. This has triggered a growing interest regarding the details of the electronic state. We were thus motivated to investigate the magnetic ground state of high-quality single crystal RuO_2 (residual resistivity ratio RRR>1,000) by muon spin rotation/relaxation experiment. We found no clear evidence from μSR measurements to suggest the development of a quasi-static antiferromagnetic order from 400 K to 4 K. The remaining possibility is that the muons happen to reside at a site where the internal magnetic field is canceling. In the presentation, we will also report the evaluation of muon site in the rutile structure deduced by first principles calculations to examine this possibility.

Primary author: Dr HIRAISHI, Masatoshi (Ibaraki University)

Co-authors: Dr OKABE, Hirotaka (KEK IMSS); Prof. KODA, Akihiro (IMSS, KEK); Prof. KADONO, Ryosuke (KEK IMSS); Mr MUROI, Toshihiko (ISSP, Univ. of Tokyo); Prof. HIRAI, Daigorou (Dept. Appl. Phys. Nagoya Univ.); Prof. HIROI, Zenji (ISSP, Univ. of Tokyo)

Presenter: Dr HIRAISHI, Masatoshi (Ibaraki University)

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