



復旦大學

Fudan University



復旦大學物理系物質科學報告

Physics Department Colloquium

Applications of Pulsed Muon Beam to Material Science at the RIKEN-RAL Muon Facility

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Abstract: RIKEN is one of Japanese national institutes for natural sciences including accelerator physics. Our laboratory has established the RIKEN-RAL Muon Facility at the Rutherford-Appleton Laboratory in the UK in 1994 [1]. The world-strongest intense pulsed muon beam is available at the RIKEN-RAL for material sciences covering physics, chemistry, biology and life sciences. We have collaborated with more than 70 Japanese and 36 International groups in the past 17 years and we are still looking for more active collaborators in order to achieve good sciences by using muons.

In my talk, I would like to shortly introduce our RIKEN-RAL Muon Facility and what is the technique named SR (muon spin relaxation/rotation/resonance). SR is a microscopic tool to sense the spin dynamics with the unique characteristic time window which is in between NMR and the neutron scattering (10^{-6} – 10^{-11} sec). This character could give us complementally and/or uniquely interesting results on the spin dynamics and electronic states of materials.

In my talk, I report some topics of our SR experiments in order to show how to use muons and how useful SR is for material researches. One example is the SR study on the pyrochlore iridate $\text{Nd}_2\text{Ir}_2\text{O}_7$ [2]. This study has been done a Chinese student of our group. This system is in a series of $\text{R}_2\text{Ir}_2\text{O}_7$ families ($\text{R}=\text{Nd-Ho}$) which show the metal-insulator transition (MIT) and also a magnetic ordering in an insulating state [3]. Our SR result clearly showed the coincidence of MIT with the magnetic transition. It was also clarified that the magnetic moment of Ir^{4+} was reduced to be less than a half but showed a coherent long-range ordered state. In conjunction with the muon-site estimation by using the density functional theory, the spin structure of Ir^{4+} moments is being investigated.

References:

[1] K. Nagamine et al., *Hyperfine Interact.* 87, 1091 (1994).

[2] H. Guo et al., *Phys. Rev. B* 88, 115206-1-8 (2013).

[3] K. Matsuhira et al., *J. Phys. Soc. Jpn.* 80, 094701 (2011).

Time: 2:00pm, Tuesday, Mar. 10, 2015

Location: Physics Building, Room 221B

(Cookies and coffee will be served from 1:30 pm)