

実験報告書様式(一般利用課題・成果公開利用)

(※本報告書は英語で記述してください。ただし、産業利用課題として採択されている方は日本語で記述していただいても結構です。)

 MLF Experimental Report	提出日 Date of Report 2012.9.11.
課題番号 Project No. 2012A0110 実験課題名 Title of experiment Characterization of the oxygen vacancy in TiO ₂ crystal by muon spin relaxation 実験責任者名 Name of principal investigator K.Shimomura 所属 Affiliation KEK-MSL	装置責任者 Name of responsible person Y.Miyake 装置名 Name of Instrument/(BL No.) D1 実施日 Date of Experiment 2012/4/17-19

試料、実験方法、利用の結果得られた主なデータ、考察、結論等を、記述して下さい。(適宜、図表添付のこと)
Please report your samples, experimental method and results, discussion and conclusions. Please add figures and tables for better explanation.

1. 試料 Name of sample(s) and chemical formula, or compositions including physical form.
TiO ₂ powder

2. 実験方法及び結果 (実験がうまくいかなかった場合、その理由を記述してください。)
Experimental method and results. If you failed to conduct experiment as planned, please describe reasons.
<p>Semiconductor photocatalytic reaction, which occurs at photoirradiated interface between a semiconductor surface and a solution, is of great importance for both fundamental studies and practical applications. Among the semiconductors, titanium dioxide (TiO₂) is one of the most efficient and promising material for photocatalytic reactions. It is known that we can see much difference in the photocatalytic activity, depending on the nature of TiO₂. Many researchers claimed the factors controlling the activity, for example, crystal structure, surface area, or surface hydroxyls. Recombination of electron-hole might be also one of the most significant factors giving influence on the activity and depend strongly on the nature of TiO₂ nano crystal, it has been suggested by the femtosecond laser spectroscopy, that oxygen vacancy might affect these recombination process, however, microscopic picture is not yet established. One of the important steps to clarify these phenomena, the spatial distribution of oxygen vacancy in TiO₂ nano crystal is very important. In this situation, MuSR</p>

2. 実験方法及び結果(つづき) Experimental method and results (continued)

We performed TF and ZF measurement at room temperature with a dedicated sample holder, which can evacuate water on the sample. With and without annealing, no difference of time spectra was observed. Therefore, the origin of the relaxation is not due to the magnetic moment of the hydrogen on the surface. The most probable origin is the moment of oxygen vacancy.