

**Experiment title:****Nanosecond time-resolved crystallography of hemoglobin by using ESRF single bunch mode****Experiment number:**

LS-1410

Beamline:

ID09

Date of experiment:

From: 12-Dec-99 to: 14-Dec-99

Date of report:

23-Feb-00

Shifts:

6

Local contact(s):

SCHOTTE Friedrich

*Received at ESRF:***Names and affiliations of applicants (* indicates experimentalists):**

Shin-ichi Adachi*, Sam-Yong Park*, Tetsutaro Iizuka

RIKEN Harima Institute, Japan

Hideki Morimoto, Khoon Tee Chong

Osaka University, Japan

Keith Moffat, Vukica Šrajer, Tsu-yi Teng, Zhong Ren, Wilfried Schildkamp, Claude

Pradervand

The University of Chicago, USA

Michael Wulff, Dominique Bourgeois, Thomas Ursby

ESRF, France

Report:

Based on our success of nanosecond time-resolved study of carbonmonoxy myoglobin (MbCO) (Šrajer et al., 1996) and carbonmonoxy magnesium-iron hybrid hemoglobin (Mg-Fe hybrid HbCO) (LS-596 March 97) photolysis, our next target is the photolysis study of carbonmonoxy hemoglobin A (HbACO) crystal in R-state. This is definitely more challenging task because 1. geminate rebinding rate of the R-state HbA is expected to be much faster than that of T-state Hb, and 2. this experiment also aims to monitor quaternary structural change of HbA caused by the R-T transition in the crystal. We had a beamtime in December 99 for this project, and tried to observe photolysis and geminate rebinding process of CO molecule in the HbA crystal.

We used femto-second laser which is newly installed at ID09 after our beamtime in Sep. 1997, and tried to observe CO photolysis in HbACO. As a joint experiment at ID09, Prof. Keith Moffat and coworkers successfully observed the photolysis of the CO ligand in Myoglobin-CO single crystal at the time delay of 500 psec. However, we had, if any, very little signal of the photolysis of the CO ligand in R-state HbACO single crystal at the time delay of 100 psec presumably due to mismatch of the timing between the laser and x-ray pulse. This mismatch is most probably caused by the timing detector system, and we need to use newly developed Ga-As detector for timing detection next time.

Šrajer, V., Teng, T. Y., Ursby, T., Pradervand, C., Ren, Z., Adachi, S., Schildkamp, W., Bourgeois, D., Wulff, M., and Moffat, K. (1996) *Science* 274, 1726-1729.