diffusion-fundamentals.org
The Open-Access Journal for the Basic Principles of Diffusion Theory, Experiment and Application

Beam induced dynamics in oxide glasses

C. Tietz[1,2]*, T. Fritz[1], K. Holzweber[1], M. Legenstein[1], B. Sepiol[1]

[1]University of Vienna, Faculty of Physics, Vienna, Austria
[2]University of Vienna, VDS Physics, Vienna, Austria
*christoph.tietz@univie.ac.at

Atomic scale X-Ray Photon Correlation Spectroscopy (aXPCS) is a powerful technique to study the dynamics on an atomic scale by using high-intensity coherent X-ray radiation. Improvements on synchrotron sources gives rise to ever increasing possibilities to study materials. Concomitantly the effects of the beam on the materials under investigation are of grand importance. While most studies of beam damages focus on structural changes, aXPCS presents the unique possibility to study the effect of high-flux X-rays on the dynamics in hard condensed matter. Such effect on the dynamics is termed beam-induced dynamics (BID) and was recently found [1] for some classes of materials [2]. aXPCS is a prime candidate for investigations of beam induced dynamics. On the other side BID opens new opportunities for aXPCS research.

In this work the results of our recent studies of beam-induced dynamics on alkali borate glasses are presented. One of the most important results is that the inverse of the correlation times is directly proportional to the X-ray flux. BID is further dependent on sample thickness and depends on the irradiation history in addition to the thermal history. Moreover, the beam-induced dynamics lack a significant temperature dependence on their own and indeed gives rise to significant structural alterations, i.e. beam damage. First results indicate that both thermally activated dynamics and BID can occur at the same time. Finally, several possible explanations for BID will be presented as well as a short outline for the future of aXPCS measurements.

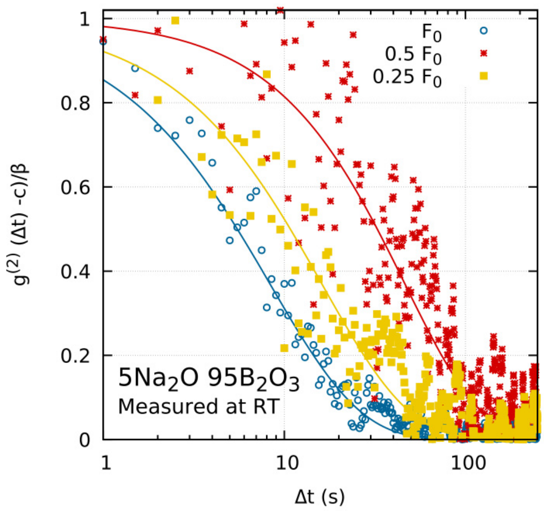

Figure 1: Flux dependency of the auto correlation function.

This work was funded by Austrian Science Fund (FWF): P28232-N36.

References

[1] B. Ruta, F. Zontone, Y. Chushkin, G. Baldi, G. Pintori, G. Monaco, B. Rufflè, W. Kob. Sci. Rep. **7** (2017).
[2] M. Leitner, M. Stana, M. Ross, B. Sepiol, arXiv:1510.01918v1.