X-ray induced dynamics in oxide glasses: a desired or undesired effect?

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Nowadays powerful X-ray sources like synchrotrons and free-electron lasers are considered as ultimate tools for probing microscopic properties in materials. The continuous improvement of brilliance and coherent flux in modern X-ray sources has indeed led to the emerging of new techniques able to probe physical properties in hard materials at the atomic level. This is particularly the case for X-ray photon correlation spectroscopy (XPCS), a technique that measures the intensity fluctuations of coherent diffuse scattering to track slow collective dynamics in complex soft and hard materials [1].
In the last years, XPCS has been successfully applied to the investigation of the microscopic relaxation processes occurring in metallic [2] and oxide glass formers [3,4] during the vitrification process and in the deep glassy state. While in the case of metallic glasses, XPCS probes the intrinsic spontaneous density fluctuations occurring in the material, the atomic motion of oxide glasses is triggered by the intensity of the X-rays [3,4]. These results show that high fluxes can alter dynamical properties in hard materials, an effect that needs to be considered in the analysis of X-ray data but which also gives novel possibilities to study materials properties since the beam can not only be used to *probe* the dynamics but also to *pump* it.
In this talk, I will discuss these results also in view of the new possibilities offered by the current EBS upgrade of the ESRF.

References

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