Ultrafast ion-induced dynamics in borosilicate glass

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Understanding the effects of ion interactions in condensed matter has been a focus of research for decades. Many of these studies focus on the longer term effects such as cell death or material integrity and this is typically performed using relatively long (>100 ps) proton pulses from radiofrequency accelerators in conjunction with chemical scavenging techniques [1]. Recently, measurements of few-picosecond pulses of laser driven protons have been performed via observation of transient opacity induced in SiO2 [2], in this work, the ultrafast response of the material can be understood by the rapid formation of self-trapped excitonic states on the order of 150 fs.

Here the onset and evolution of an ion-induced opacity is examined in borosilicate glass (BK7). It is found that the duration of the opacity is several orders of magnitude greater than the duration of the proton pump pulse that was measured in SiO2 and the underlying processes which may be affecting this extended recovery are discussed.

References

[1] G. Baldacchino, Radiation Physics and Chemistry, 77, 1218-1223 (2008).
[2] B.Dromey, et al. Nature Communications, 7, 10642 (2016).