Séminaire Imène REGHIOUA

Mardi 4 juin 2019 à 10h30

Salle réunion du LSI – bat 83-2034
Ecole polytechnique – Bâtiment 83

Pause café à 10h00

Properties of HP-HT densified silica glass under electron irradiation

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During my post-doctoral work, I was particularly interested in the study of densified silica glasses. The first part of my work consists in continuing what was already done recently [1-2]. In details, it has been shown in that the density of the HP-HT compacted silica trends to reach a common equilibrium value (~2.26) at high electron irradiation doses (~10 GGy), regardless of the pre-densification conditions of the samples and their final topology. On the other hand, another investigation underlined the straight link between the green photoluminescence emission center and the densification degree of silica. The objective of my work then is to confirm these preliminary results, by testing new HP-HT samples, low electron irradiation doses (10^6, 10^7 and 10^8 Gy) and 600 K irradiation, but overall to check out the "equilibrium density value" at very high doses (11 GGy). The obtained results show slight differences in the range of "low doses" in terms of structural modification and point defects generation. On the other side, the hypothesis of reaching the equilibrium density value (~2.26 g/cm^3) has been confirmed at the dose of 11 GGy of electron irradiation for all the studied silica samples associated to a unique Raman spectrum type attesting of an equilibrium state of silica.
The second objective of this work is the investigation of the molecular oxygen generation kinetics in the HP-HT samples under electrons irradiation. We investigated the HP-HT samples by in-situ cathodoluminescence (CL) measurements on SIRIUS. In particular, we followed the growth of the luminescent band at 1272 nm, which is attributed to the molecular oxygen in silica, as a function of electron irradiation. Our results show interesting similarities between some of the HP-HT samples and one oxygen deficient sample (ODC). Moreover, the sample with the higher initial density has demonstrated different behavior under electron irradiation.

References
[1] N. Ollier et al, "Relaxation study of pre-densified silica glasses under 2.5 MeV electron irradiation" Scientific. Reports.9, 1227, (2019).
[2] N. Ollier et al, "Impact of glass density on the green emission and NBOHC formation in silica glass: A combined high pressure and 2.5 MeV electron irradiation", J. Non-Cryst. Solids. 476, 81–86 (2017).

Séminaire INTERNE