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Full Recovery of Electron Damage in Glass at Ambient Temperatures[1] ANDRE MKHOYAN, Cornell University, ADAM ELLISON, Corning, Inc., DIETER AST, RUEDIGER DIECKMANN, JOHN SILCOX, Cornell University — An unusually complete recovery of the electron beam induced damage in a CaO-Al_2O_3-SiO_2 glass was discovered. Nanoscale measurements carried out in a scanning transmission electron microscope show that the Ca ions migrate about 10 nm away during irradiation and return during recovery. Oxygen atoms are trapped largely as molecular oxygen and do not migrate. Electron energy loss measurements demonstrate that for glass to return completely to the original compositional and structural state the following processes must take place: First, no mass loss should occur. Thus the irradiation time should be less than the time necessary for significant mass-loss to occur. Second, diffusion must be sufficient at the ambient temperature for atoms to migrate back to suitable bonding sites. Third, the role of oxygen is critical: unless oxygen is available for recombination with the displaced atoms then recovery is incomplete. Finally, the observation that the system recovers so completely (structurally, as well as compositionally) after such a substantial perturbation is evidence that the initial state of the glass must be a very stable thermodynamic minimum [1]. [1] K.A. Mkhoyan et al., Phys. Rev. Lett. **96**, 205506 (2006).

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