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Control of rehydration in sol-gel glasses CARLOS ORTIZ, DANIEL BOYE, Physics Dept. Davidson College — Optical properties of monoliths synthesized via the sol gel process result in a large number of residual silanol (Si-OH) groups, even after annealing at 900 $^\circ$C. High silanol content quenches emission from rare earth ions via excitation of vibrations of the silanol groups. Medium density glasses (1.5gcm^{-3}) have a highly interconnected porous structure that allows the diffusion of molecules throughout the material. Diffusion of atmospheric water molecules results in chemiadsorption reactions that increase silanol group content, adding to quenching. By monitoring the intensity of terbium (Tb^{3+}) emissions from the $^5D_3$ level relative to the $^5D_4$ level, we report an 80% decrease in ratio within 12 hours. Monoliths prepared with of N,N-dimethylformamide, a drying control chemical additive (DCCA), were annealed at 1050 $^\circ$C and maintained good optical quality with nearly complete densification of the material (2.1gcm^{-3}). DCCAs minimize the capillary stresses in the network during drying, even during the onset of viscous flow at the glass transition. Monoliths prepared with DMF and annealed at 1050 $^\circ$C for 6 hours showed no change in their $^5D_3$: $^5D_4$ intensity ratio upon exposure to the atmosphere.

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