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**Modeling time-dependent upconversion in Er-Yb doped sol-gel silicate glass** DREW ONKEN, D.G. HAMPTON, C.J. TRENNEPOHL, D.M. BOYE, A.J. SILVERSMITH, Davidson College — Examining pulsed IR to visible upconversion in $Er^{3+}$-$Yb^{3+}$ doped sol-gel silicate glass may lead to applications in fiber optic communication due to the similar time scale of its GHz bandwidth. Excited state absorption of $Er^{3+}$ accompanying energy transfer from neighboring $Er^{3+}$ and $Yb^{3+}$ is responsible for the upconversion process. The dynamics of $Yb^{3+}$ to $Er^{3+}$ energy transfer are studied by observing green emission from the $^4F_{7/2}$ and $^4S_{3/2}$ levels of $Er^{3+}$ after a 6-ns pulsed laser excitation of the $^2F_{5/2}$ level of $Yb^{3+}$ at 978nm. This study examines the time-dependence of the fluorescence emission by varying the $Yb^{3+}$ concentrations and the annealing temperature. Our previous work has shown that the rare earth ions reside on the pore surface, and so the nanoporous nature of the sol-gel glass creates a finite reservoir of energy donors in each pore. These finite energy reservoirs foil the application of standard rate equation models and instead necessitate Monte Carlo simulations which can be used to determine the physical parameters of each energy transfer step in the upconversion chain.

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