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Energy Transfer Networks in Highly Defective Materials TED LAURENCE, Lawrence Livermore National Laboratory — In highly defective materials, where the defect density approaches the atomic density, the electronic structure of the material may be expected to deviate strongly from descriptions provided by bulk solid state theory or molecular and atomic physics. For sufficient defect densities, significant interactions between defects may strongly affect the temporal and spectral characteristics of both excitation and emission of electronic excitations. Previously, we discovered a novel photoluminescence with a distribution of fast photoluminescence decay times in surface flaws in fused silica that is correlated with damage propensity with high fluence lasers. Here, we propose a model to explain the origin of this PL and provide evidence that this model is in effect in this system and in other highly defective systems. We propose that the distribution in lifetimes observed is not simply due to a large variety of defect states, but due to a variety of energy transfer interactions between defect states. These highly defective material properties are of especial significance at surfaces and in nanostructured materials. This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

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