Abstract Submitted
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A unified model of charge transport in highly insulating materials[1] ALEC SIM, Utah State Univeristy — We present results on a detailed study of electron transport in highly disordered insulating materials, (HDIM). Since HDIMs do not lend themselves to a lattice construct, the question arises how can we describe their behaviour in a consistent theoretical framework. The unification of a large group of experiments, theories and models is brought together in a single formalism to answer this question. It is shown that carrier transport in HDIMs is governed by the density of states, (DOS) in the band gap, subsequent trapping and de-trapping, physical models and the transport equations. We facilitate the discussion with a simple set of DOS models. First a discussion of microscopic kinetics in the band gap is presented. It is shown that trapping, de- trapping, the transport energy, quasi Fermi level, segregation time and recombination as general concepts determine the character of the transport. This microscopic picture gives rise to a clear understanding of the macroscopic carrier transport in HDIMs. Finally it is shown that a simple set of transport equations when cast in the new formalism gives rise to a wide array of experimentally observed behaviours. We conclude with a discussion of four experimental applications used by the USU space environments effects group.

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