Extensions of the Walden-Wintle Model of Charge Transport in Disordered Materials for Charge Injection with Electron Beams[1] JR DENNISON, GREG WILSON, Utah State University, ALEC SIM, Irvine Valley College, JODIE CORBRIDGE GILLESPIE, Utah State University — We have extended the Walden-Wintle model for charge transport through highly disordered insulating materials to include charge injection with a charged particle beam. The original model is applicable to charge injection in a dielectric material from a pair of electrodes in a parallel plate geometry. It provides a versatile approach to predict the time-dependant current at a rear grounded electrode, as the injection current density evolves over time with the development of a space charge barrier near the injection electrode. This includes standard Fowler-Nordheim, Schottky injection, space charge limited injection, and various tunneling mechanisms. Our new model modifies the approach to include electrode-less charge injection via a charged particle beam, along with concomitant effects for the injection current, surface voltage, and electron emission as a charge is built up in the insulator. The approach is equally valid for near-surface injection and bulk injection for non-penetrating radiation and for penetrating radiation. The results are based on our dynamic emission model for yields dependant on accumulating charge in both the positive and negative charging regimes.

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